

MAY

Stopping Radio Howls—page 835

25 CENTS

POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN DO IT

REG. TRADE MARK GREAT BRITAIN No. 139

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SEE PAGE 712

70,000 JOBS YEARLY for Tractor, Electric and Auto Experts

"70,000 men were put to work last year as mechanics and a large percentage of them knew no more about an automobile than does the average owner," says James M. Cleary of the Studebaker Corporation. He adds: "At \$50.00 per job 400,000 car owners each day give their cars into the hands of mechanics for repairs and there is no way of estimating how many of these 400,000 mechanics know how to fix their cars satisfactorily."

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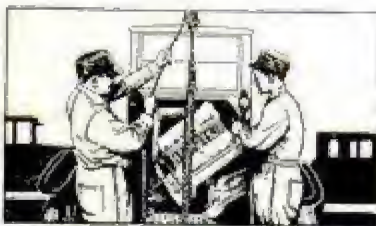


Read, READ—at the left—what a prominent Studebaker executive says. No wonder automobile manufacturers and 20,000,000 car owners are tearing their hair and pleading—"Give us more trained auto experts—quick." Deliver us from the untaught, half-baked "mechanics" who are working millions of dollars damage to our cars DAILY because they don't know their business. In only 8 weeks I will train you to fill one of the 70,000 Big Money jobs that will be open this year.

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I Pay Your Railroad Fare Myself



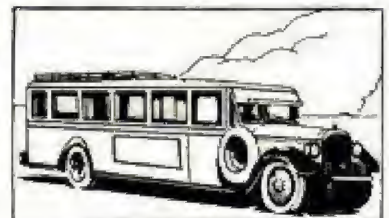
"No more farming for me. I'm leaving for British Honduras where I am to get my board and clothes free and a salary of \$300.00 per month on a two years contract. Your training did it."

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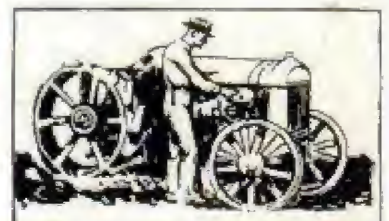
While my Special Reduced Price Training Offer lasts, I will pay railroad fare to Cincinnati. My course teaches you more in 8 weeks than you would learn in 4 years as a "handy man" around a garage.

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"Have just sent one of my friends to your school. Am doing fine myself, making \$300.00 every month. Thanks to you." J. L. JOHNSON Benham, Ky.



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To the man who is 35 and DISSATISFIED



WE DELIBERATELY pass over a large proportion of the readers of Popular Mechanics in order to address this page directly to *men in their thirties*.

There is a powerful reason for this. The dissatisfied man of twenty-five is not usually in a difficult position. He has few responsibilities; he can move easily; he can take a chance.

But from thirty-five to forty is the age of crisis. In these years a man either marks out the course which leads to definite advancement or settles into permanent unhappiness. There are thousands who see the years passing with a feeling close to desperation.

They say

"I must make more money," but they have no plan for making more.

"There is no future for me," but they see no other opening.

"I am managing to scrape along now, but how in the world will I ever educate my children?"

To men whose minds are constantly—and often almost hopelessly—at work on such thoughts, this page is addressed. It is devoid of rhetoric. It is plain, blunt common sense.

Let us get one thing straight at the very start—we do not want you unless you want us. There is the dissatisfied man who will *do* something and the one who won't. We feel sorry for the latter, but we cannot afford to enroll him. We have

a reputation for training men who—as a result of our training—earn large salaries and hold responsible positions. That reputation must be maintained. We can do much, but we cannot *make* a man succeed who will not help himself. So rest assured you will not be unduly urged into anything.

Now what can happen to

A dissatisfied man who acts?

We wish we could answer that question by letting you read the letters that come to us in every mail. Here is one for example—from Victor F. Stine of Hagerstown, Md. "I was floundering around without a definite goal," he says, "and was seriously considering a Civil Service appointment." (You can tell from that how hopeless he was. A Civil Service appointment means a few thousand dollars a year for life.)

"The study of the Course and Service was not a hardship," he continues, "rather it was a real pleasure because it is so practical and inspiring throughout." (The *method* of the Course makes it practical and inspiring. We teach business not alone thru study but thru *practice*. You learn executive thinking by meeting executive problems and making executive decisions.) "Added self-confidence and increased vision gained from the Course," says Mr. Stine "enabled me to accept and discharge added responsibilities successfully."

He is Secretary now of the organization in which he was then a dissatisfied cog.

"Forging Ahead in Business"

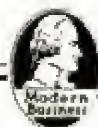
For a man like Mr. Stine we can achieve really great results. By learning, thru the Modern Business Course and Service, the necessary fundamental facts of all departments of business, he insures his success. His judgment, his value, increase. The closed roads open. The worries disappear.

We attach a coupon to this advertisement. It is a little thing, but our experience proves that it separates out of every hundred readers the few who can act. If you are one of these let us mail you that wonderful little book, "Forging Ahead in Business." For thousands it has turned dissatisfaction into immediate progress.

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Signature.....
Please write plainly

Business Address.....

Business Position.....



In love affairs always second best

SHE had been explaining palmistry to both of them; but when it came to a demonstration she held his rival's hand, not his. "Nothing to worry about," he thought bitterly to himself, "except that I can't understand why it is always like this." Always, in love affairs, he came off second best.

* * *

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London: Hachette & Cie.,
16-17 King William Street, Charing Cross, W. C. 2

Paris: Hachette & Cie.,
- 111 Rue Reaumur

Melbourne: Gordon & Gotch
509-513 Little Collins St.

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Entered as Second Class Matter Sept. 16, 1903, at the Post Office at Chicago, Illinois, under Act of March 3rd, 1879.

Entered as Second Class Matter at the Post Office Department, Canada.

Published monthly by POPULAR MECHANICS CO.

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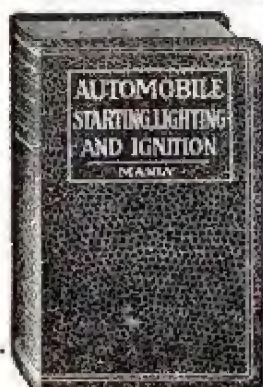
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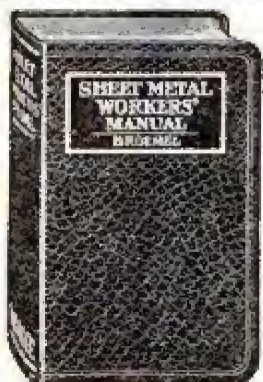
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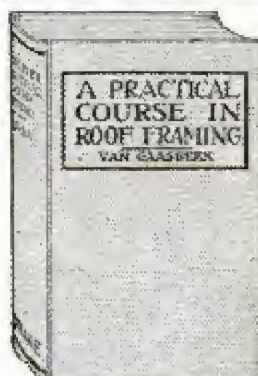
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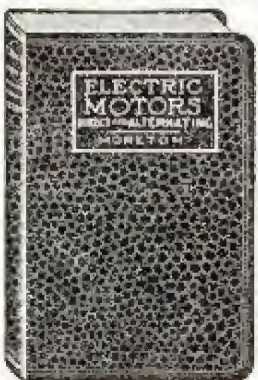
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"He's the only one of the old gang who made good"

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An I. C. S. course enabled Fred W. Southworth to leave a poorly paying job that he had held for twenty years and get a position as a salesman. In six months he increased his salary more than 300 per cent.

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The way is easy! Just mark the work you like best in the coupon below. Then mail it today.

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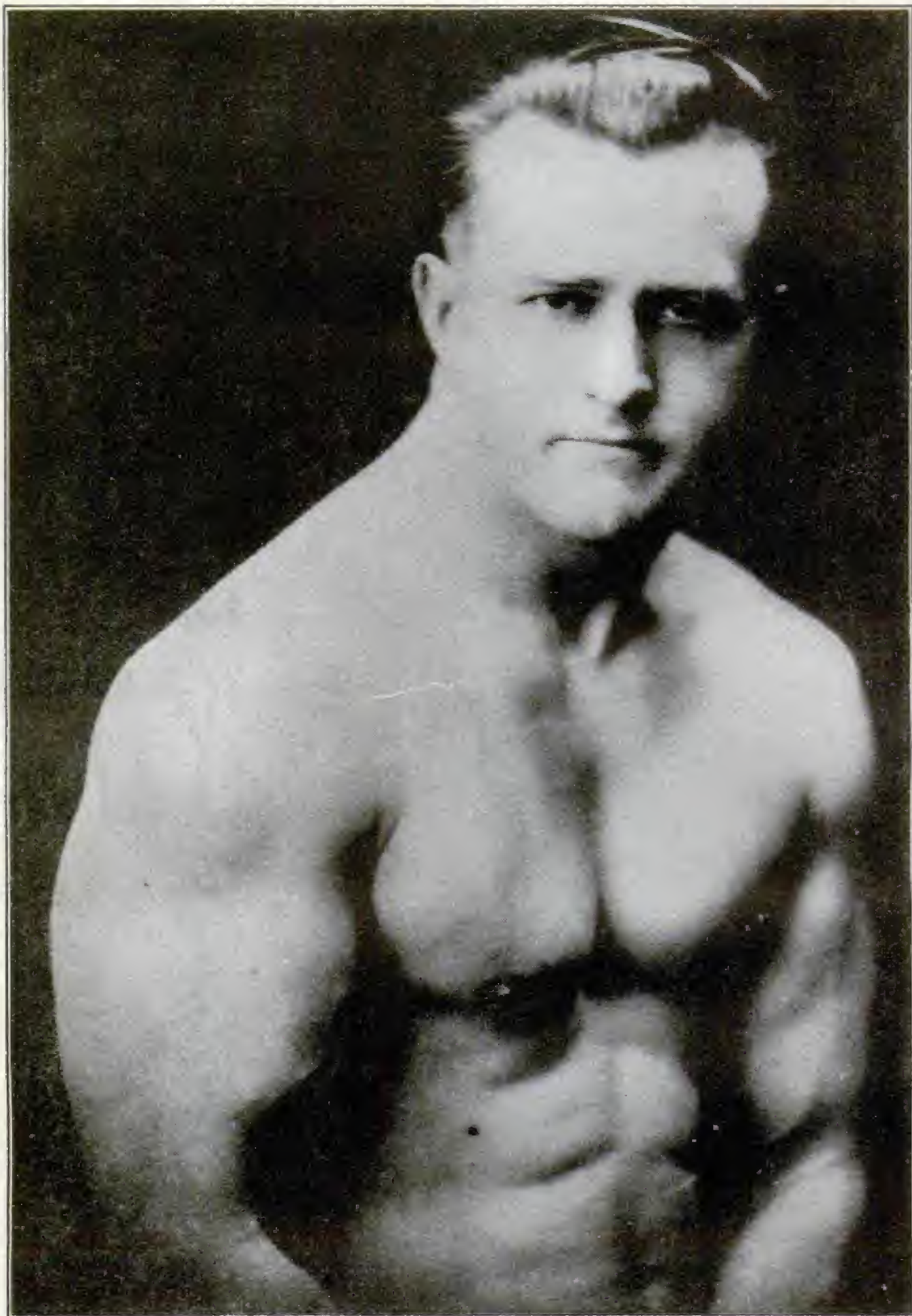
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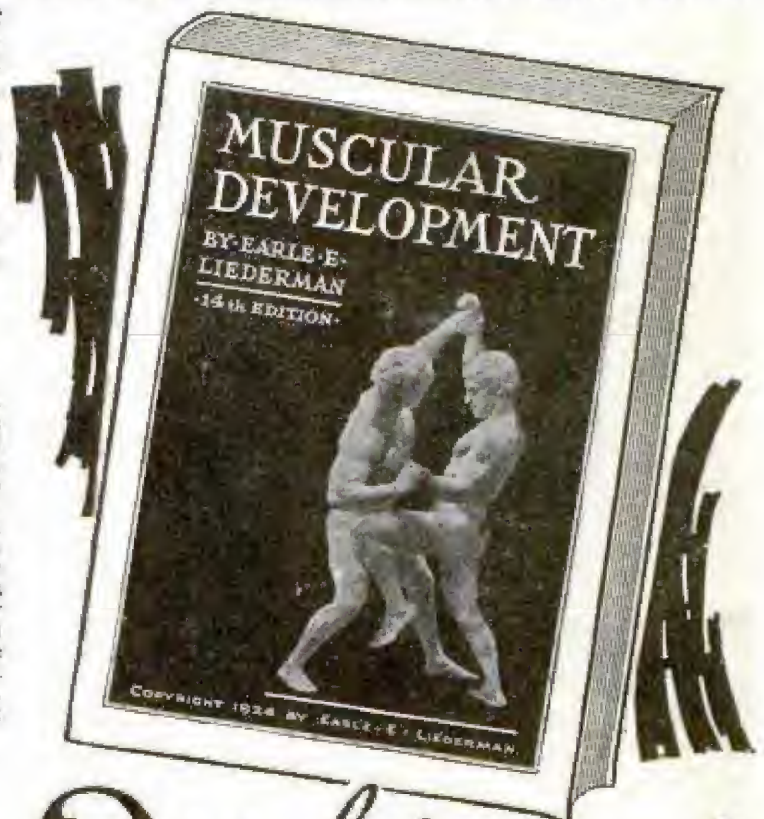
THE WISE MAN

Some men never pay any attention to the condition of their house till it begins to fall on their head. Others watch for the first sign of a crack and immediately have it put in condition. How about the house you live in—your body? Are you going to let it clog up and waste away until you suddenly realize you have tuberculosis or some other dreadful, incurable disease? Get wise! Check up on yourself! Put your body in shape and keep it so.

An apple is no good unless you eat it. Let it lie, and it will rot away. Let your muscles lie idle and they will waste away, but use your muscles and you have more muscle to use.

"THE MUSCLE BUILDER"

That's what they call me. I don't claim to cure disease. But I do absolutely guarantee to make a strong, husky man out of anyone who will give me a chance. If you wait until some disease gets you, the doctor is the only one who can save you—but come to me now and the doctor will starve to death waiting for you to take sick. I'll put one inch of solid muscle on your arm in just thirty days and two inches on your chest in the same length of time. But that's only a starter. Then comes the real works. I'll put an armor plate of muscle over your entire body and build up the walls in and around every vital organ. I'll shoot a quiver up your spine that will make you glow all over. You will have a spring to your step and a flash to your eye that will radiate life and vitality wherever you go. And what I say doesn't just mean *maybe*. I absolutely guarantee these things. Do you doubt me? Then make me prove it. That's what I like. Are you with me? Come on, then. Let's go.



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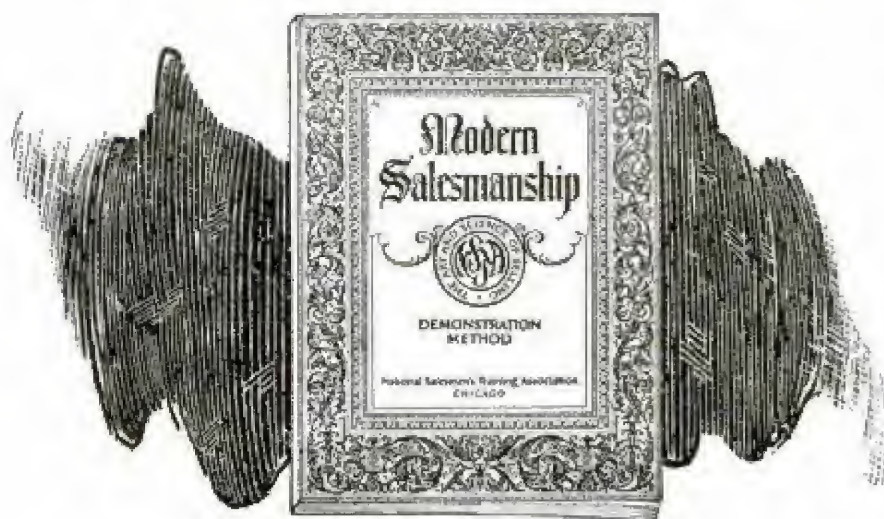
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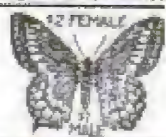
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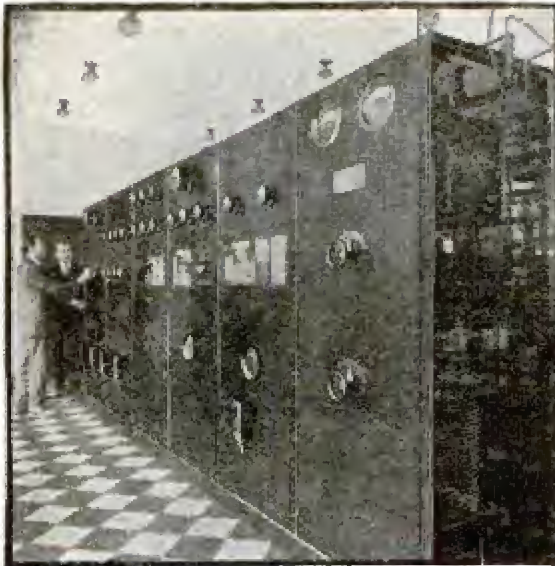
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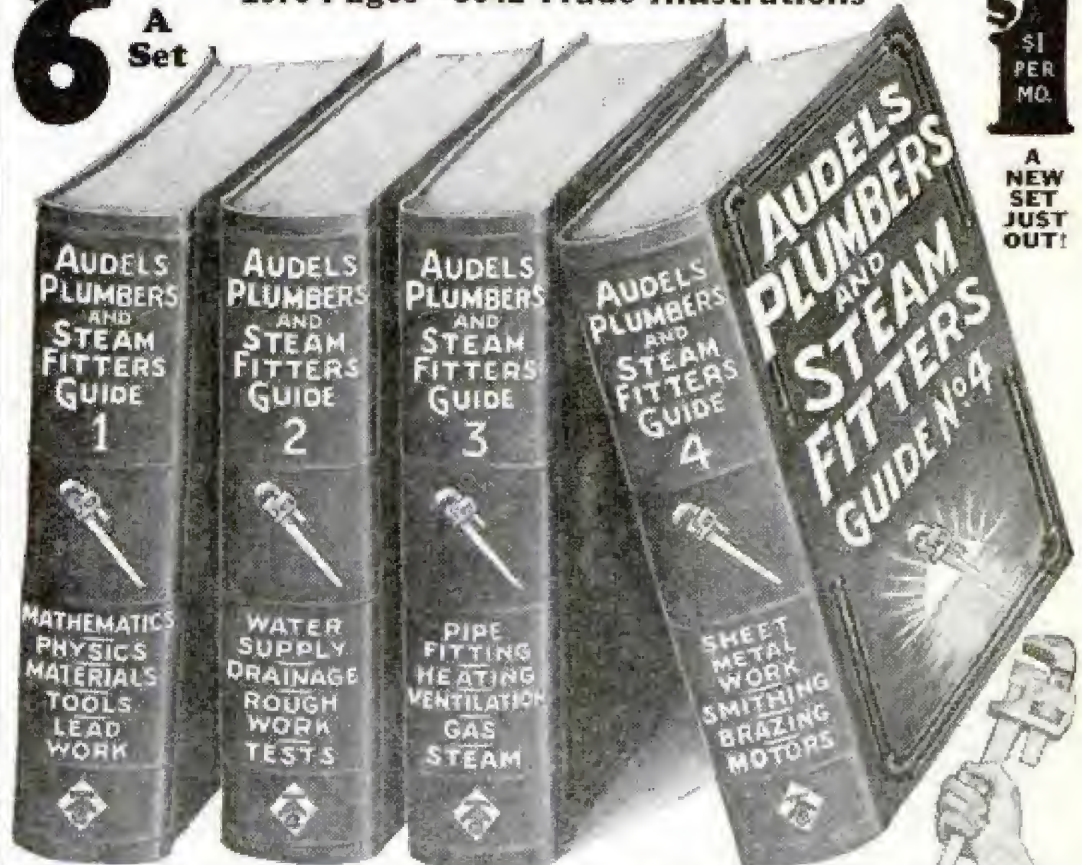
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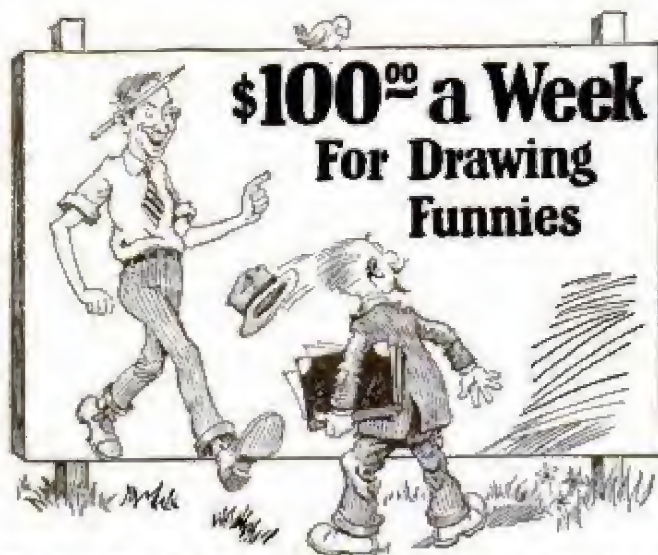
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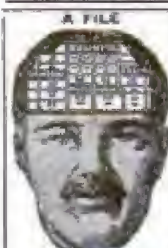
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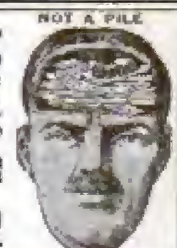


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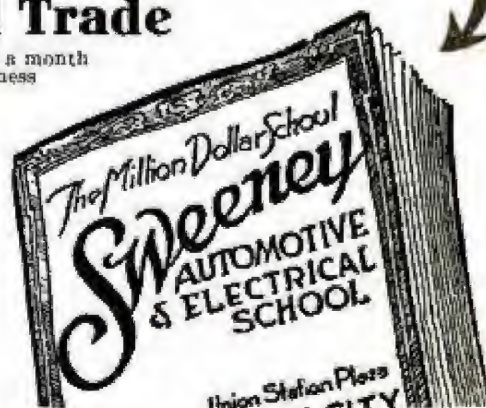
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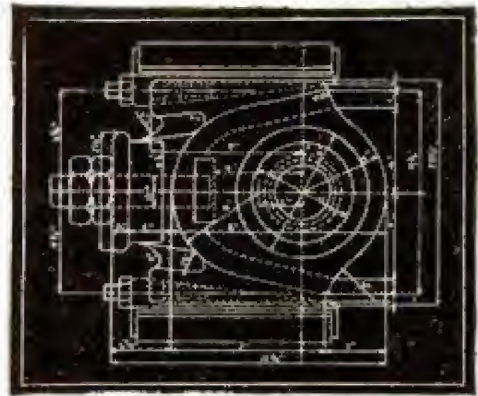
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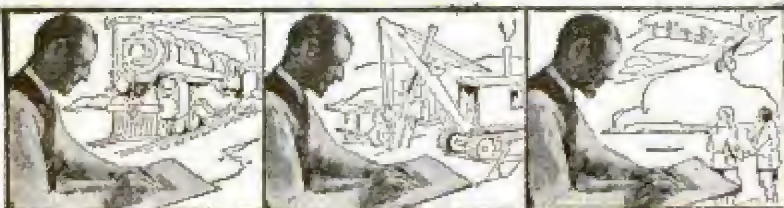
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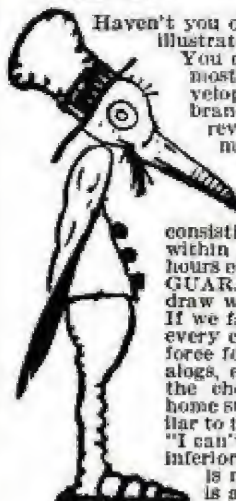
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"Can he really play?" a girl whispered.
 "Heavens, no," Arthur exclaimed. "He
 never played a note in his life."

They Laughed When I Sat Down At the Piano But When I Started to Play!—

ARTHUR had just played "The Rosary." The room rang with applause. Then to the amazement of all my friends, I strode confidently over to the piano and sat down.

"Jack is up to his old tricks," somebody chuckled. The crowd laughed. They were all certain that I couldn't play a single note.

"Can he really play?" I heard a girl whisper to Arthur.

"Heavens, no," Arthur exclaimed. "He never played a note in all his life . . ."

I decided to make the most of the situation. With mock dignity I drew out a silk handkerchief and lightly dusted off the piano keys. Then I rose and gave the revolving piano stool a quarter of a turn. The crowd laughed merrily.

Then I Started to Play

Instantly a tense silence fell on the guests. I played the first few bars of Beethoven's immortal Moonlight Sonata. I heard gasps of amazement. My friends sat breathless—spellbound! I played on.

A Complete Triumph!

As the last notes of the Moonlight Sonata died away, the room resounded with a sudden roar of applause. I found myself surrounded by excited faces. Everybody was exclaiming with delight—plying me with rapid questions . . . "Jack! Why

didn't you tell us you could play like that?" . . .

"Where did you learn?" . . .

"Who was your teacher?"

"I have never even seen my teacher," I replied.

"And just a short while ago I couldn't play a note."

"Quit your kidding," laughed Arthur, himself an accomplished pianist.

"You've been studying for years. I can tell."

"I have been studying only a short while," I insisted. "I kept it a secret so that I could surprise you folks."

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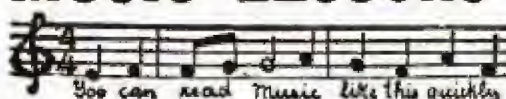


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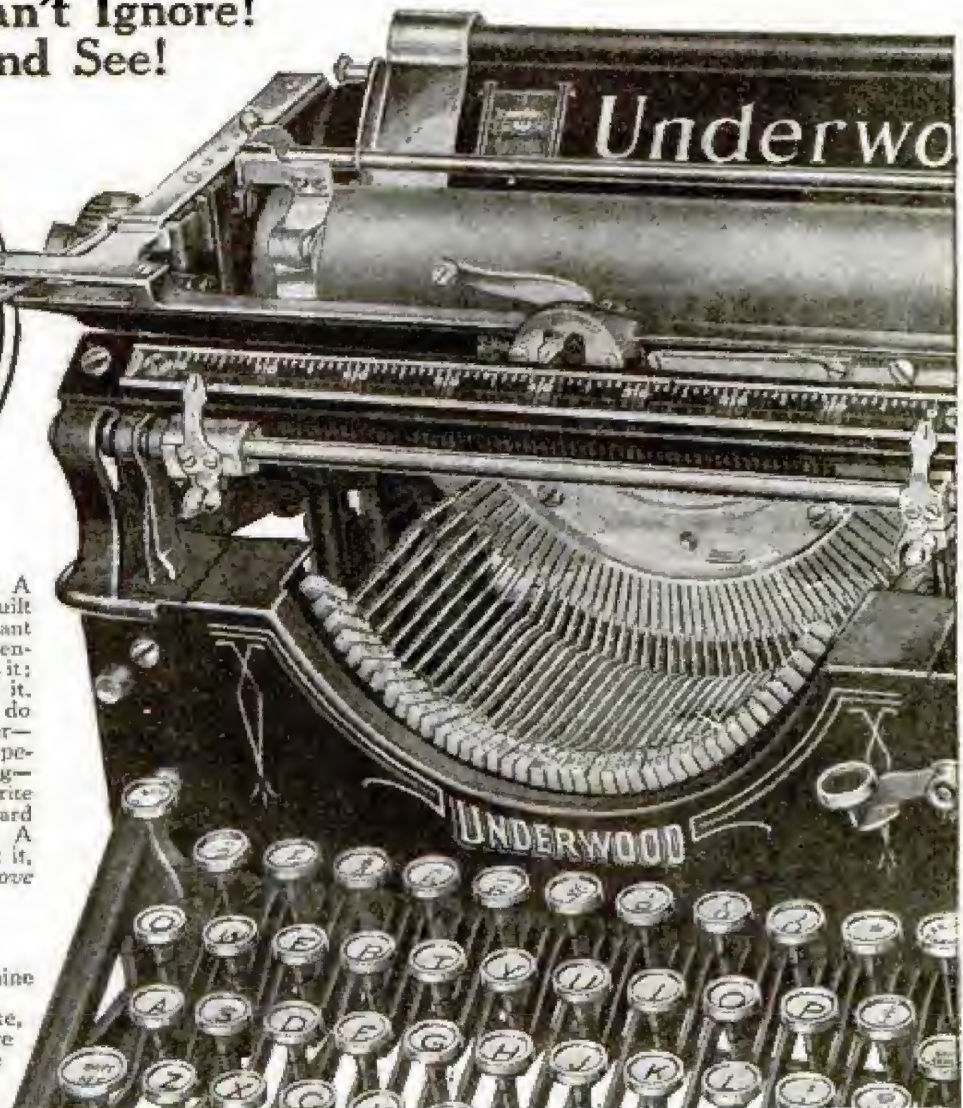
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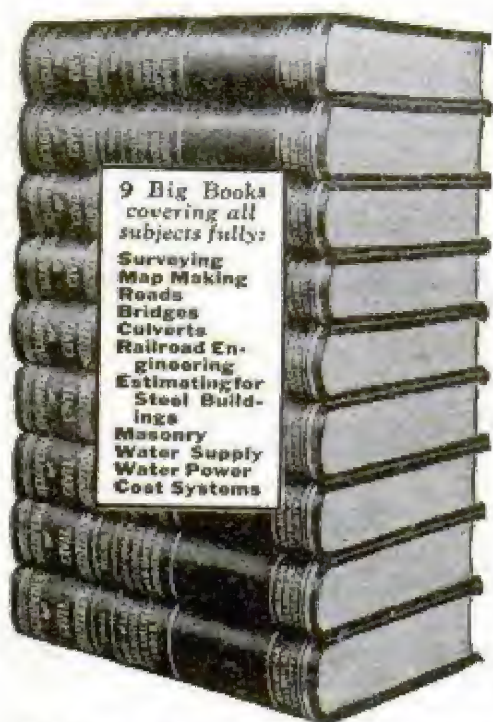
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\$183 Clear Pay in 1 Week

THE picture at the left shows Joseph Hansen of 2558 Third Street, Detroit, Michigan, shaking hands with Mr. D. D. Buick, one of the organizers of the Buick Motor Company and now Director and Chief Engineer of the Detroit School of Trades. Hansen, formerly a shop worker, making 65c an hour, completed the course in Bricklaying in record time. He now writes:

"Your employment department put me out on a job the day I left school. After one week I went on full scale at \$1.65 an hour. I have worked full scale ever since and haven't missed a day.

I took some special jobs on my own hook. One of them paid me \$106.00 profit for four days work on a fireplace. Another job, a store front, paid me \$183.00 clear for six days.

Now I am ready to go into the contracting business for myself and figure on cleaning up at least \$15,000 this year. Never laid a brick in my life before and the Detroit School of Trades absolutely did these things for me. I recommend the school and its instructors to any man who really wants to learn a trade."

Joseph Hansen

Get Into the Building Trades

An Amazingly Easy Way for Any Man to Learn a Big Pay Building Trade

READ that letter of Hansen's over again.

Hansen is no different from you. And he is like hundreds of other men who have graduated from the Detroit School of Trades. He got tired of working on inside jobs for small pay. He wanted to get out where a man had some freedom and where he could make some real money.

Here's the biggest news ever announced for men who are tired of working long hours for small pay. Factory men, inside workers, office men, shop workers—anyone who wants to get out into the open, do a man's work, and get paid every week any amount from \$1.25 to \$2.00 an hour—can now get into the building trades in a short time. Under the old system of apprenticeship a man worked on an average of three years before being qualified. Now you can get a good start in these building trades in considerable less time in this big school. Read the offer on this page.

LEARN BY DOING

Five years ago he couldn't have done what he did. Then if he had wanted to get into the building trades he would have had to serve a long apprenticeship. But Hansen took the short cut. He came to the school here in Detroit. He went through with a guide. He saw for himself how plumbing, bricklaying, plastering, carpentry, electrical, paper hanging are being taught in this big school by practical men. All students work on the actual work with tools, not books.

BUILD 2-STORY HOUSE!

Hansen saw that we build a complete two story brick house in the school building every three weeks, finish it complete from foundation to electric wiring and wall papering. He talked to the other men. He realized, just as you will, that he could really learn what he wanted to know at this big, successful school. Hansen enrolled and long before his regular course was over he was at work outside and completed his instruction in the night classes.

SUPERVISED by STATE BOARD

Here's your opportunity! The Detroit School of Trades is licensed by the STATE OF MICHIGAN and operated under the supervision of the State Board for Vocational Education. We teach the subjects listed in the panel in a practical, approved manner. We are not making any extravagant claims about teaching you to earn \$10,000 a year. Instead we just tell you

the facts. We know from what other men have done that you can enroll in this School in any of these courses and go to work when you finish at good wages. Figure it out for yourself. You know what men in the building trades make. You can make just as much. And remember this, any man who really learns his trade always has an opportunity to do contracting for himself. It takes very little money and many of our students have entered this profitable field after only a few months as building trades mechanics.

Information FREE

Get more information. It won't cost you a cent. It may mean success for you. Simply fill in the coupon with your name and address. Mail it today to the School and we'll send you our catalog and list of trades. You won't find a line of exaggeration in the catalog. It is inexpensive—the saving is passed on to you in lower tuition—it is straightforward and simple. Read the catalog. You will find out just what you want to know. Then make up your mind. But right now, before you forget, send this coupon to the School.

DETROIT SCHOOL OF TRADES

Dept. 526-A, Detroit, Mich.

A Licensed School operated under the Supervision of the State Board of Vocational Education.

All departments of the School are located in this big building right in Detroit's business district, one block from river.



WE TEACH THESE COURSES

Bricklaying
Plastering
Plumbing
Carpentry
Electrical
Sign Painting
Paper Hanging
Interior Painting
Plan Reading
Estimating
Auto Mechanics
Auto Painting
Auto Trimming
Metal Finishing
Acetylene Welding
Machine Shop
Tool Making

Detroit School of Trades Department 526-A, Detroit, Michigan

Send me your plain and straightforward catalog of information on the trades taught by your school, showing tuition and time necessary to complete the training. I am under no obligation whatever.

Name.....

Address.....

City..... State.....

\$5 DOWN NOW—*and No More Payments* *BUYS ANY* **WITTE Engine** *Until October 1st*

Now, more than ever, the need for economical, dependable power is felt by the producer who is faced with ever-increasing labor costs. **WITTE Throttling Governor ENGINES** answer this important question perfectly—now an economical, dependable power plant is within the reach of everyone.

Today the **WITTE ENGINE** sells at the lowest price in history. Into this **WITTE** has gone the ripe experience of more than 42 years of engine building—over 100,000 users all over the world have placed upon it their stamp of approval. You, too, can put a **WITTE** on your place, secure in the knowledge that represents the

Up to 10 H-P.



The One-Profit Engine

The **WITTE Throttling Governor**

the original and leader of the throttling-governor type. An even steady speed with a big surplus of power for the heavy loads. The minimum in fuel consumption—the **WITTE ENGINE** burns kerosene, gasoline, gas-oil, distillate or gas at a fuel cost of less than 2c an hour per H-P. Simple, trouble-proof and guaranteed for a lifetime of hard work. Completely equipped with **WICO** Magneto, speed and power regulator and throttling governor.



The **WICO Magneto**

—the most perfect system of high tension ignition known. Makes starting easy, even at 40 below zero—sure performance in any climate or temperature. Not affected by rain, hail, snow or sleet. The perfect replacement for old-style battery-equipped engine.

Makes all Jobs Easy and Cheap—No need to do the hard, back-breaking work—no need to pay high prices for poor labor—you can show \$1,000.00 more profit every year you have a **WITTE** working on your place. Investigate now!

All Sizes, 2 to 25 H-P. Easy Terms. \$5 Now—Pay No More Until Oct. 1st.

Ask for Our Big FREE ENGINE BOOK or if interested, ask for our Log and Tree Saw, 3-in-1 Saw Rig or Pump catalog.—**ED. H. WITTE.**

QUICK SHIPMENTS MADE FROM NEAREST OF THESE WAREHOUSES: Minneapolis, Minn.; Atlanta, Ga.; Trenton, N. J.; Richmond, Va.; Tampa, Fla.; New Orleans, La.; Dallas, Tex.; Laredo, Tex.; Denver, Colo.; Billings, Mont.; Spokane, Wash.; New York, N. Y.; Albany, N. Y.; Bangor, Me.

WITTE ENGINE WORKS,

(FOUNDED IN 1870)

1744 WITTE BLDG., KANSAS CITY, MO.
 1744 EMPIRE BLDG., PITTSBURGH, PA.
 1744 WITTE BLDG., SAN FRANCISCO, CALIF.



DO YOU LIKE TO DRAW?

It's Easy To Learn When Shown In The Right Way

Some of cleverest cartoonists and comic artists in America today learned how to draw quickly—by following **CARTOONIST EVANS' SIMPLE AND EASY METHOD**. This school is recommended by foremost cartoonists because they know the students are handled right. If you like to draw, send 6c in stamps for **portfolio of cartoons and full details**. The course is **NOT EXPENSIVE**.

The W. L. Evans School of Cartooning

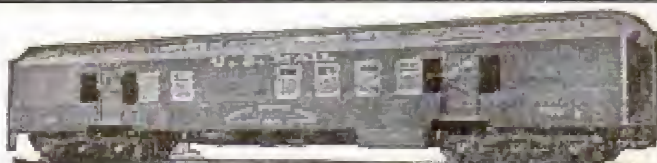
821 Leader Building
 CLEVELAND, OHIO

Work for "Uncle Sam" RAILWAY POSTAL CLERKS MAIL CARRIERS

\$1700 to \$3000 a Year

TRAVEL—See your country on government pay
MEN—BOYS, 17 UP SHOULD MAIL COUPON
 IMMEDIATELY

Steady Work No Layoffs Paid Vacations



FRANKLIN INSTITUTE, Dept. R-129, Rochester, N. Y.

Sirs: Rush to me without charge: (1) Specimen Railway Postal Clerk Examination questions; (2) **FREE** book describing U. S. Government positions open to men and boys and full particulars telling how to get them.

Name

Address

No Wonder \$66^a day is Easy



27,000,000 Readers of National Magazines are waiting to buy this astonishing invention from YOU. It is never sold through stores. Start cashing in now—while the name "KRiss-KROSS" is on every tongue!



When You Show Men This Amazing New Way to Shave!

Marvelous new invention offers unbelievable opportunity to make big money: Kriss-Kross Salesmen everywhere are cleaning up \$30 to \$60 a day with clock-like regularity. Read every line of this announcement.

I DON'T care who you are—you never had a chance to make money like this before. The KRiss-KROSS idea has swept the country like wildfire. Unless you are making over \$300 a month, you're simply cheating yourself if you pass up this opportunity to put away \$350 to \$800 cash profit every 30 days!

What Is It?

KRiss-KROSS—the magic self-seller—is a super-stropper or blade-rejuvenator. It is showing millions of men an amazing new way to shave without buying new blades. Unlike anything ever placed on the market before, This astonishing invention prolongs the life of any make blade for weeks, months, and even years! Its mechanical ingenuity is little short of marvelous. It strops with a diagonal stroke, just like a master barber. Eight "lucky leather grooves" do the trick in eleven seconds and leave your blade with the keenest edge that steel can take!

Give Men a Mystery Gift Razor Free!

Our unique selling plan makes everything easy as ABC for you. One of the greatest helps we give you is a brand new kind of razor that you offer FREE to every man you meet. Just think what a wonderful opening that gives you!

This unusual razor is really three razors in one! It is instantly adjustable—straight, T-shape, or diagonal. Exclusive feature cuts beard resistance 45% and gives the smoothest shaves you can imagine. As an attention-getter and salesman, this FREE razor has never had an equal in the history of selling!

FREE \$5,000 Sales Manual Shows Exactly How to Sell

And now, in addition to advertising in all the big magazines, we are going still farther to help you make big money with KRiss-KROSS. At an expense of \$5,000 we have prepared a

brand-new sales manual—the equal of a \$150 course in salesmanship. This surprising little book tells you exactly how to sell KRiss-KROSS—what to do and save. This remarkable book with all its selling secrets could easily sell for \$2. We give it to you FREE!

Get Started at Once

Right now is the time to begin reaping big profits with KRiss-KROSS. Thousands of dollars are being spent to pave the way for you through advertising. Territories are going fast. Find out all about this sensational, money-making business without delay. See how simple it is to make \$100—\$225 a week with KRiss-KROSS—the most unique self-seller of all time. This proposition calls for quick action! Clip the coupon immediately. No obligation. Mail it tonight!

RHODES MFG. CO.

Dept. E-370

1418 Pendleton Ave., St. Louis, Mo.

Rhodes Mfg. Co., Dept. E-370
1418 Pendleton Ave., St. Louis, Mo.

Please send me full details of your nationally advertised KRiss-KROSS stropper—and explain your unusual sales plan. Also tell me how I can make big money, giving away KRiss-KROSS razors FREE.

Name.....

Address.....

City.....State.....

Get Into This



three times this summer. When I went to M. S. A. S. I knew nothing about a car."

Big business and pleasant climate all year round. Come now and fit yourself for a better job or to run a garage business of your own. Thousands of battery shops, auto electrical shops, tire and welding shops are needed now. Only trained men can run them. Good work is what car owners want, and it takes a trained man to do it. Jerry De Nooyer, Battle Creek, Mich., writes: "Am Service Manager of Cadillac and Olds service station at \$80 a week."

Ray Walker, Bethlehem, Pa., says: "Had my pay raised

Are you ambitious? Are you seeking a better job or a business of your own? If so, here's your chance—a chance to really cash in. There are more amazing money-making opportunities in the automobile business now than ever before. Follow the lead of the thousands of "Michigan State" graduates. They have already proved what real training will do for an ambitious man. They are making big money. You can too! This school has 20,000 graduates. 700 students here now. Come to Detroit, a fine city.

START NOW!

A thorough training in Detroit, at the "Michigan State," fattens the pay envelope or starts you in business for yourself. You can take a full Automotive Course in 12 weeks. Or our great Master Course in 30 weeks. Or specialize in any of its money-making branches; be an Auto Electrician, Battery Service Man, Engine Man, Tire Expert, or Machinist. All courses include training in Business, Shop Management, Service, Selling, etc., by one of the big men from Detroit's auto plants. Classes always open. You can start at once. Jump right on the train for Detroit. I. Dittner, proprietor of General Garage, New Hamburg, Ontario, says: "I started in business 6 months ago and your course has paid me double already."



Learn at Detroit The Auto Center

Without any previous experience—just a liking for mechanics—you can learn the auto business from A to Z in a few weeks at the Michigan State Automobile School in Detroit, the heart of the industry. Then step out, equipped with knowledge and training, to a future of certain, big money making. You have great advantages, learning the business here. It's the fountain head of the automotive industry. You are taught under factory endorsed methods. You learn both theory and practice on latest equipment. Go through the great Ford plants. Visit the other auto factories. Learn their methods first hand—and it all means greater opportunities and more certain success. The Michigan State Automobile School, in Detroit, the automobile center, is the logical place to learn the auto business.

NOW 20 MILLION CARS

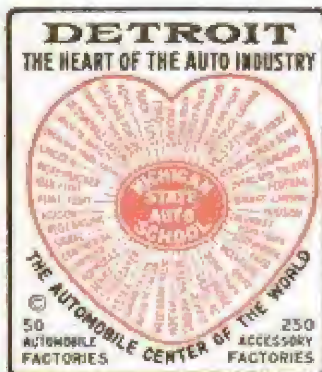
More than 20,000,000 automobiles now registered in the U. S. A. Every year the figure grows. That means more skilled auto men needed—more money spent for repairs—more money that you can be earning when you become a M. S. A. S. graduate. Victor and Elmer Hanson (Buick and Chevrolet dealers), Wakefield, Mich., write: "The net worth of our business is now \$35,000."

JUMP A HEAD OF THE CROWD

Some men think they can learn the business by starting in green as a helper in a garage. They are wrong. Years of

dirty work will be wasted learning wrong methods from poor mechanics. Save all this by coming to the auto center for a few weeks. Learn right, under expert instructors. Learn the short cuts and best ways of doing electrical repairs, engine work, all about autos, trucks and engines. O. E. Parker, Buick dealer, Howell, Mich., writes:

"After finishing at the school I could locate any trouble and fix it, and in many cases quicker and better than men who had years of experience."



1926 Buick Master Six

Completely equipped chassis of the 1926 "Master Six" Buick, just one of the many fine cars here for you to learn on. The co-operation of the automobile manufacturers is one of the big advantages which you have in coming to the "Michigan State" in Detroit, the Auto Center. Many of the big companies assist us for your benefit. Here you work on up-to-date equipment, under the guidance of expert instructors. M. S. A. S. courses are long and thorough. Your M. S. A. S. diploma means much to you. It gives you the double prestige of being a "Michigan State" graduate, and of being a Detroit-trained man.

MICHIGAN STATE

305 Auto Building

Detroit, Michigan

Learn Autos Where Autos Are Made

BIG MONEY Business

Here is a Chart of Facts—

authentic figures which point out the opportunities. Autos are increasing faster than repair shops or mechanics can keep up with them. 20 million cars are in use now. The auto industry leads all others in value of production. There are more autos than telephones. 269 cars to every service station. This shows as plain as A-B-C where the big chance is today. Walter Burk, Danville, Ill., writes: "I take care of 60 big trucks for the State of Illinois Highway Department, and have been with them since I graduated." What thousands of others have done, you can do, too. You have even a better chance than they had, because there is a **bigger demand** for trained men than ever was before. Service managers tell us that 100,000 new trained auto mechanics are needed **every year**. Not nearly enough are starting, and a **trained man** can get a good job any place and any time.

Good Positions Open

The demand for trained men is greater than the supply. We cannot fill all the calls we get. Look into any garage that is run by trained men—everybody busy, earning big money. These opportunities can be yours too with "Michigan State" training. **Earn while you learn if necessary.** Some students work evenings to pay their way. Others work days and take our evening classes.

FREE BUSINESS COURSE

Business Management Course by Packard Service Manager is Free to all students. Tells how to locate and start a garage, how to meet customers, how to sell cars, gives you invaluable business advice. No extra charge.

Home Study Course

This is free to students who intend to come to School later but can't come now. You can start to learn at home. Helps you get a garage job right away. Write for full information and explain your circumstances.

AUTOMOBILE SCHOOL

3729 Woodward Avenue, Detroit, Michigan

The Automobile Center

YOU CAN MAKE GOOD TOO

Here is Harold Grenert, Holyoke, Mass., one of the thousands of "Michigan State" graduates who have achieved quick success. He is just an ordinary fellow, much like the rest of the men who come to this School to get their start on the Road to Success. Read his letter:

From \$20 a Week to \$70

"I now have complete charge of all electrical equipment on the busses operated by the Hartford, Conn., and Springfield, Mass., Bus Co. I have three electricians under me. I receive \$70.00 a week as a salary. Two years ago I left a \$20.00 a week job. Thanks to the M.S.A.S. training, I now receive \$70.00, more than three times as much."



20,200,000
Automobiles in U.S.
One Car to Every
6 People
269 Cars to Every
Repair Shop
Thousands more Trained
Men are Needed

YOU'LL ENJOY A SUMMER IN DETROIT

Detroit is not only a great city for business, but it's also a celebrated "summer resort" city. Here business is always good and weather is always fine. That's a sure winning combination.

Detroit's location in the center of the Great Lakes district gives it ideal climate, not too cold in winter, not too hot in summer. Situated on beautiful Lake Erie and the Detroit River. Get away from the burning sun into the cool breezes of Michigan. After school hours, enjoy boat trips, swimming, fishing, sailing, canoeing on the lakes and river. Public bathing beaches near us, beautiful parks, excursion trips.

See major league baseball games—see Ty Cobb, Babe Ruth, Walter Johnson, Eddie Collins, Speaker, Sisler—all the stars. Spend a pleasant summer and improve yourself at the same time. We work hard here but we believe in some good times, too.

Write Us Today

Get all the interesting facts. They will open the way to a brighter future for you. Write a letter or a postcard or use this coupon. **DO IT NOW.**

(Colored students not enrolled, except for our home study course.)

Mail Today!

Michigan State Automobile School
305 Auto Building, Detroit, Michigan

Send me free and without obligation complete information about Detroit training to make the most money, also photographure book on Detroit, "Auto School News," Chart of your Courses, and hundreds of your Graduates' letters.

Name

Street or R. F. D.

City.....State.....

I am interested in { 12 weeks' Auto Course
30 weeks' Master Course
Home Study Course



"Somebody Else Got Half My Salary"

I worked for years at a small salary and then suddenly I woke up! Somebody else was getting half my salary!"

"I don't mean that somebody was actually stepping up to the window and taking the money out of my pay envelope, but it amounted to the same thing. Other men were getting the better jobs and the bigger salaries that I might just as well have been getting. My salary was only half as big as it should have been.

"You'll have to stop that," I said to myself, so I decided to take up one of those I. C. S. courses that the Boss had been recommending.

"In three months I got my first raise and in the next eighteen months I got three more raises. That I. C. S. course certainly did help me to get ahead. But I hate to count up how much I lost by not taking it sooner."

Why don't you take up a course with the International Correspondence Schools and prepare to earn more money? You know as well as we do that to earn more you've got to learn more.

One hour a day, spent with the International Correspondence Schools in the quiet of your own home, will prepare you for the position you want in the work you like best. Yes it will! Put it up to us to prove it.

Mail the Coupon for Free Booklet

INTERNATIONAL CORRESPONDENCE SCHOOLS

Box 5577-E, Scranton, Penna.

Without cost or obligation, please tell me how I can qualify for the position or in the subject before which I have marked an X:

BUSINESS TRAINING COURSES

- | | |
|--|---|
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Salesmanship |
| <input type="checkbox"/> Industrial Management | <input type="checkbox"/> Advertising |
| <input type="checkbox"/> Personnel Organization | <input type="checkbox"/> Better Letters |
| <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Show Card Lettering |
| <input type="checkbox"/> Business Law | <input type="checkbox"/> Stenography and Typing |
| <input type="checkbox"/> Banking and Banking Law | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Accountancy (including C.P.A.) | <input type="checkbox"/> Civil Service |
| <input type="checkbox"/> Nicholson Cost Accounting | <input type="checkbox"/> Railway Mail Clerk |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Common School Subjects |
| <input type="checkbox"/> Private Secretary | <input type="checkbox"/> High School Subjects |
| <input type="checkbox"/> Spanish <input type="checkbox"/> French | <input type="checkbox"/> Illustrating <input type="checkbox"/> Cartooning |

TECHNICAL AND INDUSTRIAL COURSES

- | | |
|---|--|
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Architect |
| <input type="checkbox"/> Electric Lighting | <input type="checkbox"/> Architects' Blueprints |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> Contractor and Builder |
| <input type="checkbox"/> Mechanical Draftsman | <input type="checkbox"/> Architectural Draftsman |
| <input type="checkbox"/> Machine Shop Practice | <input type="checkbox"/> Concrete Builder |
| <input type="checkbox"/> Railroad Positions | <input type="checkbox"/> Structural Engineer |
| <input type="checkbox"/> Gas Engine Operating | <input type="checkbox"/> Chemistry <input type="checkbox"/> Pharmacy |
| <input type="checkbox"/> Civil Engineer | <input type="checkbox"/> Automobile Work |
| <input type="checkbox"/> Surveying and Mapping | <input type="checkbox"/> Airplane Engines |
| <input type="checkbox"/> Metallurgy | <input type="checkbox"/> Navigation |
| <input type="checkbox"/> Steam Engineering | <input type="checkbox"/> Agriculture and Poultry |
| <input type="checkbox"/> Radio | <input type="checkbox"/> Mathematics |

Name.....
 Street.....
 Address.....
 City..... State.....

Occupation.....
 Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

Learn to Write

I Teach by Mail

I CAN make a good penman of you at your home during spare time, no matter where you live or how poorly you now write. My simplified system has shown thousands of others the way to good penmanship during the past twenty years — it can and will do the same for YOU!

Beautifully Illustrated Book

"How to Become a Good Penman"

It contains general information, with testimonials and beautiful specimens of penmanship showing what others have accomplished by the Tanblynn System. (Your name elegantly written on a card if you enclose stamp for postage.) **WRITE TODAY. Address**

F. W. TANBLYNN
 418 Ridge Bldg., Kansas City, Mo., U. S. A.



FOREST RANGERS

Men wanting Forest Ranger, Railway Mail Clerk and other government positions write for particulars.
MOKANE, 286, DENVER, COLO.



"BECOME A LIGHTNING TRICK CARTOONIST"

Send \$1.00 for Laugh Producing Program of 28 Trick Drawings with Instructions. Catalog of Chalk Talk Supplies Free.
BALDA ART SERVICE, Dept. 1, Oshkosh, Wis.

Ride A Ranger

The finest bicycle ever built. 44 Styles, colors sizes; made in our new factory. **SAVE \$10 to \$25 by direct from the factory purchase.** Delivered free on approval, express prepaid, for 30 Days' Free Trial. Easy Payments, if desired.

Tires best quality, at factory prices, express paid. Lamps, wheels, horns, equipment and repairs at unusually low prices. **Send No Money, do business direct with makers.**

Mead CYCLE COMPANY

DEPT. H-109 CHICAGO

Write today for free Ranger Catalog, factory prices and marvelous easy payment terms.



OPPORTUNITIES IN Salesmanship

Become a Salesman

Every phase of business revolves around selling. The trained salesman is in demand—he can fix his own hours, choose his own field, control his own pay. His income depends only upon his results—there is no limit to what he can earn. We train you to sell successfully thru the LaSalle problem method under supervision of expert salesmen. Train in your spare time. Low cost; easy terms. 64-page booklet, "The Modern Salesman, Ambassador of Progress," free. Send for it today.

LaSalle Extension University, Dept. 564-5 Chicago



FREE



Free

\$20.00 Tenor Banjo

When You Enroll

GENUINE professional tenor banjo—a absolutely free when you enroll in Charles McNeil's famous home-study banjo course. It is a handsome, full-size instrument, worth \$20 or more at any store.

Earn Big Money—Quick!

With this course it is easy to earn big money. Simple as ABC—but the course has all technical requirements. Includes phonograph records, demonstration, jazz, strakes, breaks and chords, played by Charles McNeil, 5 years with Isham Jones Brunswick Recording Orchestra. Easy payments. Write for free book. Charles McNeil, Director, Chicago Tenor Banjo Institute, 1621 Lincoln St., Dept. 1355, Chicago, Ill.

Phonograph Records Included




New Way to Make Money at Home

We have openings for a few new members in Fireside Industries, a national organization of artistic homewerkers. No experience needed. We teach you just what to do and furnish outfit to members without extra cost. Satisfaction guaranteed.

FREE BOOK Tells How

You can easily make extra money, in spare hours or full time, without leaving home. Fascinating work, decorating beautiful art novelties to supply big demand. Read experiences of successful members.

FIRESIDE INDUSTRIES
Dept. 66-E, ADRIAN, MICH.

Send 2c now for postage on FREE BOOK—LET giving full details

FREE BOOK

Act Now!

New 1926 Free Offer

Every subscriber to the NEW LIBRARY OF MACHINE SHOP PRACTICE will receive, if he acts at once, a copy of Gardiner's great book—PRACTICAL FOREMANSHIP—a book that tells you everything the successful foreman must know. It is a book every ambitious man can use.

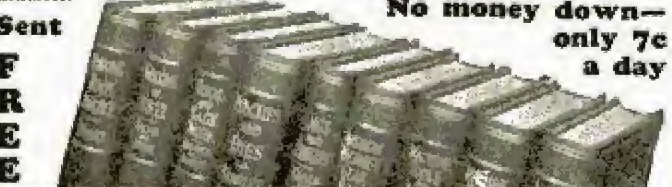
GET IT FREE—NOW—WITH

Machine Shop Practice

9 volumes—3065 pages—3608 illustrations
(A combined home-study course and reference library)

The New Machine Shop Library is written for practical men. It gives you the best methods for every kind of machine shop work. It explains machine tools and their operation, drawing and design, tool work, gears and grinding, dies and fixtures, automatic screw machines and their tools and all of the mathematics you will ever have to use. It is plainly written, completely illustrated—the very best kind of help to the machine shop man who wants to advance himself.

Sent FREE



No money down—only 7c a day

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc., 370 Seventh Ave., New York

Send me for 10 days' free examination the New Library of Machine Shop Practice. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the special price of \$15.50 is paid. If not wanted, I will return the books at your expense. On receipt of my first payment of \$1.50 it is understood that I am to receive, free of charge, a copy of the second edition of Gardiner's PRACTICAL FOREMANSHIP.

Signed.....

Address.....

City and State.....

Position.....

Employer.....

P. M. 5-1-26

Be a BRICKLAYER

Make \$60 to \$90 a week

Learn this Big Pay Trade at Home in a Few Short Months!



BRICKLAYING is the best trade in the world for a man of ambition. First, because wages are so high; \$11 and \$14 a day for regular time; and \$20 and \$25 a day for overtime. Secondly, work is steady—because there is a shortage of 38,000 bricklayers.

And now you can learn this big pay trade at home—in spare time—by an amazingly quick, easy method known as "Job-Analysis." In a few short months I teach you MORE than the old time bricklayer learned during his four years apprenticeship. You build walls, panels, pilasters, jambs, piers, arches, corbels, etc., in your own cellar, garage, yard, shed or roof using bricks, mortar and trowel. You perform in your lessons, EVERY job which you will afterwards perform on the wall as a highly paid bricklayer. And you learn quickly and become more skillful than you could by the old time apprentice method because you don't have to "pick it up" as best you can. The pictures, diagrams, blue prints, charts and instructions are so clear that it is just as if I stood back of you, directing every movement; showing you every short cut; training your hands and eyes.

The lessons are easy to understand because of the many diagrams and illustrations. You just get enough written instructions to make you quick and skillful; everything else is illustrated.

Furthermore: I teach you things the ordinary bricklayer doesn't know. How to read blue prints and plans; how to lay off buildings; how to buy materials; how to estimate; and other information designed to equip you to rise rapidly to Foreman, Superintendent, Estimator, Contractor or Builder—if you are ambitious.

Free Book Explains

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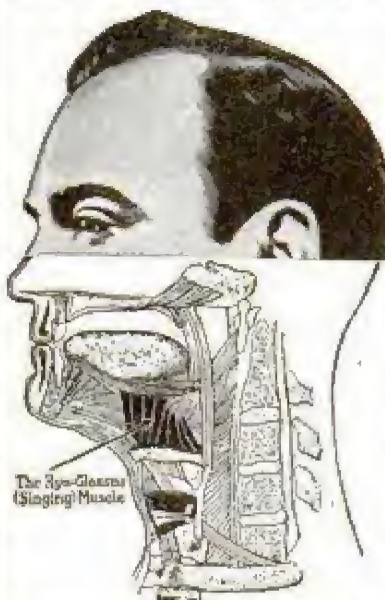
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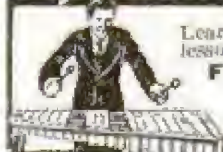
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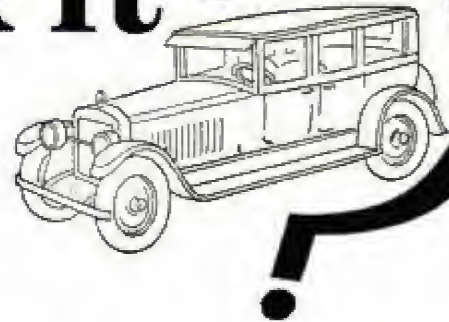
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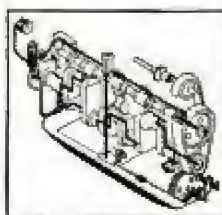
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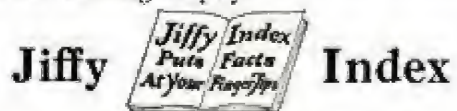
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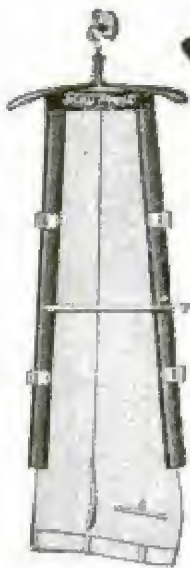
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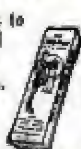


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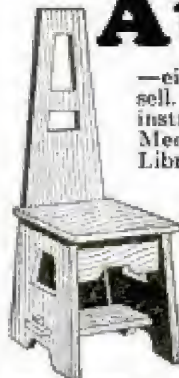
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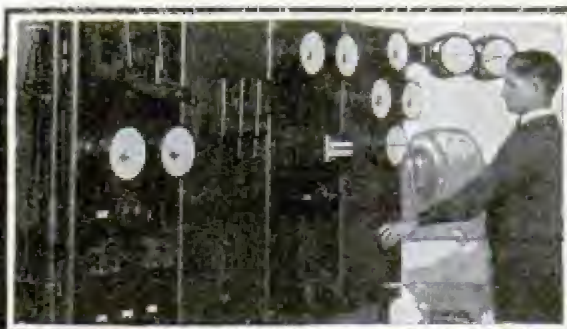
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PATENT—Fortune in Stop-Direction Signal on Autos visible all around. Sale or royalty. F. Cox, 820 Cass St., Chicago.

HAVE You Anything to Exchange, Buy or Sell? Send your list at once describing everything, price asked if for sale, or article wanted in trade. May find you customers. Market for Exchange, Room 718, 88 Broad St., Boston, Mass.

WANTED. Agents and Representatives. Have you a Ford? Be Independent—Have a business of your own. No Capital Required. All or Spare Time; Protected Territory—Everything Furnished. Full details and sample \$1.50 to warrant interest—deducted or refunded at your option. United Machinery Company, Cincinnati, U. S. A.

AGENTS—Gold Leaf Window Letters and Script Signs. No experience; 500% profit. Consolidated, 656 South Dearborn, Chicago.

\$16 A DAY Easy—I start you in Auto Accessory business; no investment, no experience necessary. Landin, 941 W. Van Buren St., Chicago.

50c TO \$1.00 profit each sale. No delivering. License nor stock necessary. Bonanza. Free particulars. Mission Factory 519PM, 3228 West Pico, Los Angeles, Calif.

BE Independent. Make—Sell your own specialties. Immense profits. Catalog dependable. Formulas, special selected. Agent's best sellers free. M. Listro, 832 East Pershing, Chicago.

BUILD splendid business making chipped glass number and name plates, signs, check-boards. Write for particulars. Simpler Utility Co., 1123 Broadway, New York.

AGENTS—Stappest household line on earth. Red hot sellers, steady repeaters—100% profit. 350 light weight, fast selling, popular priced necessities. Selling outfit free. Get busy quick. Write today; postal will do. American Products Co., 5785 American Bldg., Cincinnati, Ohio.

\$50 WEEKLY—Our Pocket Inhalers Selling Like Blazes. Sample 25c. Chas. Witt Co., Matewan, W. Va.

AGENTS: Every auto owner a prospect. Money maker, samples. Kahrs, Valley Stream, New York.

AGENTS: Newest, fastest selling Auto necessity out. Sells on sight, 100% profit. No competition. Write quick. Todd Oil & Paint Co., Cleveland, Ohio.

66 MILES on 1 Gallon—Amazing Scientific Gas Saver. All autos. 1 free. Critchlow, M-134, Wheaton, Ill.

ARE You Old at Forty? See our advertisement on page 116 of this issue. The Electro Thermal Company, 2137 Main Street, Steubenville, Ohio.

PATENTS. Time counts in applying for patents. Don't risk delay in protecting your ideas. Send sketch or model for instructions or write for Free book "How to Obtain a Patent" and "Record of Invention" form. No charge for information on how to proceed. Communications strictly confidential. Prompt, careful, efficient service. Clarence A. O'Brien, Registered Patent Attorney, 58-G, Security Bank Building (directly across street from Patent Office), Washington, D. C. See pages 140 and 141.

GET posted—Good prices paid for butterflies, insects. See Sinclair display advertisement, page 18.

AGENTS—30% commission. Full line glove silk lingerie and guaranteed hosiery, mill to wearer; lowest prices. Get particulars. Wright Hosiery Mills, Philadelphia, Pa.

AGENTS Make More \$\$\$. Sell by Mail. High Class Merchandise. We Supply Handsome 76 page Catalogues. Your Imprint, Sample and Particulars Free. Address James M. Northern, Northern Bldg., Haddon, La.

AGENTS: \$50 to \$200 per week with our window letters. Easily applied by anyone. Samples free. E. Shaw, 12 Carlton Ave., Brooklyn, N. Y.

AGENTS—Get in the "Big Money" class. Why knock on back doors trying to sell. Be a business man among business men. Call on Offices, Drug, Cigar, Men's Furnishing and General Stores. Sell at wholesale and make hundreds of dollars in monthly profits. Wonderful new necessity imported from the Orient. Selling like Blue Blazes. Write or wire quick for full details. G. F. Foster Products Co., 25 Industrial St., St. Paul, Minn.

SALESMEN—Sell New "Flash" Fire Extinguishers. Men wanted everywhere. Make \$600.00 per month. Improved extinguisher operates like flashlight. Retail \$7.50 to \$12.00. Large commissions. Developed by United States Government Air Service. Stock equipment now on Government airplanes. Be first in field with this new invention. Full or part time. No experience necessary. Write quick. Automatic Fire Extinguisher Co., Desk A-3, 219 S. Ludlow, Dayton, Ohio.

BEST seller in twenty years. Johnson makes \$12,000 yearly. New men \$5,000 up. Exclusive territory. Write quick. Surety Mfg. Co., 264 W. Washington, Chicago.

I WANT a partner-agent to take care of my business in your town. I furnish everything, including world's finest line of 175 household products and I split the selling price with you 50-50. Beautiful sample outfit makes selling easy; food products; household necessities; things people eat; highest quality—lowest price—quick sales—permanent repeat business; \$25,000.00 bond guarantees quality. I pay largest commissions—give Chrysler closed car besides. Get my amazing offer for your locality quick. Write or wire C. W. VanDeMark, Vice Pres., Health-O Products Co., 100 E. Heath-O Bldg., 117 Duane St., Cincinnati, Ohio.

"LIQUID-LEATHER" Fills Holes in Shoes, Rubbers, Tires. Dries Instantly. Pliable, Waterproof. Just Imported from France. Tube Retail 60c—Cost 25c. Sells Housewives. Sub-Agents. Nulife Leather, Hartford, Conn.

GOLD-LEAF Sign Letters; make and sell; 1,000% profits. Particulars, Johnston Co., Quincy, Ill.

GOLD Sign Letters. One Cent Each. Non-Tarnishable. Free samples. Catalogue. Foil Sign Works, 832 W-11-Street, Oakland, Calif.

AGENTS—Glass Name Plates. Gold Leaf and Silver Lettering. Sample with your name 75c. Sell \$1.25. Send name in print with Money Order. H. Fette, 588 Main St., East Haven, Conn.

10c PUTS your name on mailing list year. Latest money makers. Kentucky Agency, Covington, Ky.

\$20.00 DAILY easily made. Great opportunity. 95c profit every dollar. Whirlwind seller. Legitimate working plan and formula sent for a \$1.00 bill. Mr. Flood Coast, Emlenton, Pa.

MAKE big money selling one dollar vest pocket Check Protectors. Ready market, quick sales, large profits, no competition. Hundreds sold in every town. Every writer of checks prospective customer. Sold on money-back guarantee. Send dollar today for machine and agents proposition. Same to be deducted from first order or refunded if not satisfied. Eveready Check Protector Co., P. O. Box 416, Sherman, Texas.

SUCCEED With Your Own Products— Make them yourself. Formulas, Processes, Trade-Secrets. Modern master methods. Catalog free. B. Thaxly Co., Washington, D. C.

AUTOMOBILE Specialties. Guaranteed formulas for all latest money makers. Lowest prices. Write for free lists. Murphy, Chemist, Tujunga, Calif.

SOMETHING new—Presto Rubber Repair for tires, tubes; all rubber goods put on cold, no heat, acid or tools; vulcanizes itself in few minutes. Sells to auto owners and dealers, sample free. Pioneer Products Co., Dept. A, Roebling, N. J.

BIG Profits; 83c every \$1 sale. New Guaranteed Auto discovery. Fast repeater. Specialty Mfg. Co., Boone, Iowa.

\$100 and over weekly selling our Newly Patented Auto Specialties. Others doing it; so can you. Free sample and particulars. Jackson Manufacturing Co., 1818 Curtis St., Denver, Colo.

"YOUR Dollar Getting Opportunity" is a small pamphlet we'd like to send you, together with Free Sample of our product. Write today. Mallard Chemical Company (P.M.), Saint Louis, Mo.

AGENTS coinng money selling "Lanowa" products. Greatest utilities known. Big demand everywhere. Write quick for sample. Fraser Products, 305-J 43rd, Kansas City, Mo.

\$35.00 PROFIT on \$1.50 Outfit; Gold Transfer Monograms for Automobiles. Free Samples. National, Station D, Brooklyn, N. Y.

MAIL-ORDER Houses and Distributors: We pack French made beauty creams, face powders, perfumes, toilet preparations with your label. Chemist, A2700 Wabash Ave., Chicago.

BIG Spring Money-maker. Everybody is polishing furniture and cars these days. Sell Glass Oil, the wonder polish. Other household necessities. Write today. Duo Co., Dept. G1, Artlen, N. Y.

JUST Out—It's a new, patented apron without strings, straps, buttons or hooks. On or off in a jiffy. Not sold in stores. Attractive patterns. 9 out of 10 women buy. Big profits—\$1 an hour to \$12 a day. We deliver and collect. Write today sure for sample offer and details. Sta-Put Co., 721 N. 11th, St. Louis, Mo.

PUT Your Money on a Winner. Lightning Polishing Cloth makes old Silver look like New. Tested and Approved by Good Housekeeping. Profit 100%—200%. Sells on sight. Free samples. Lightning Products Corporation, 1773 Greenleaf Ave., Chicago.

AGENTS: Full or spare time—to sell hand painted scarfs, dollies, pillows. Extremely low priced. A wonderful new process. Our agents are cleaning up. Paintographs practically sell themselves. Write for full particulars of liberal agency offer, and circulars describing Paintographs today. Bradfords, Dept. 60A, St. Joseph, Mich.

OH hello! why didn't I see this before? Christy's Iron Rust and Stain Remover sells like blazes. Write for free sample and terms. A. N. Christy & Co., 5067 Union, Newark, N. Y.

\$100 TO \$150 Weekly. Wonder-Automatic Washer. Patented. Does large family washing spotlessly clean in 30 minutes. Creates its own power. Will last a lifetime. Sells for \$7.50. Unusually large commissions. Eureka Supply Co., Dept. 6, Sedalia, Mo.

SALESMEN—here's the double income line—1 call, 2 sales. Helix Hosiery. Hangerie, guaranteed. Low prices, generous commissions. Write for result-producing plan. Helix Co., 213-AF Fourth Ave., New York.

BIG Money Selling New Household Cleaning Set. Washes and dries windows. Sweeps, scrubs, mops. All complete only \$2.95. Over half profit. Write Harver Brush Works, 132 3rd St., Fairfield, Iowa.

MAN in each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

AGENTS make 500% profit handling auto monograms, sign letters, novelty signs, etc. Catalog free. Hinton Co., 122 E. 58th St., Chicago, Ill.

IF We Give You shoes made-to-your measure in any one 60 leathers, 50 different styles, will you keep them, wear them, show them to your friends as sample of our \$10 Made-To-Order shoes to sell at \$6.85? Advise us today. Your complete outfit will go forward absolutely free at once. Dept. 2085. Tailor-Made Shoe System, 932 Wrightwood, Chicago.

WASH Clothes the new way. Use the Torrent Automatic Washer. You will be delighted. Special offer to one in each locality. Storm Royalty Co., 2610 Enright Ave., St. Louis, Mo.

BRING Home the Bacon—selling Stuart's famous Food Flavors. Quick sellers. Big profits. Write for free sample and terms. C. H. Stuart & Co., 6567 Main, Newark, New York.

WE Start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 2480, St. Louis.

BIG Money—fast sales; everyone buys gold initials for their autos; sell \$1.50, profit \$1.44. Ten orders daily easy. Samples, information free. World Monogram, Dept. 16, Newark, N. J.

GIVE Away finest laundry soap Free. You'll make \$10 daily easy by new selling plan. Big repeat business. Write quick. Wolverine Soap Co., 28 Wolverine Bldg., Grand Rapids, Mich.

AT Last! Diamond Rival Discovered! Amazing blue white Rajah Gem astounds jewelry world and deceives experts! Beautiful Sample case Free! \$100 weekly! Write Quick! Rajah Diamond Co., Dept. F-7, Salisbury, N. C.

IF you want good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. M. L. Rund, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

AGENTS: 500% profit. "Happy Home Maker Shampoo" builds your own big business. Martin of Indiana made \$75.00 in one day. Missouri man made \$750.00 one month. Exclusive territory. Gen. A. Schmidt & Co., Dept. P, 236 W. North Ave., Chicago.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

FREE Sample. "Rain Shield Wiper." Retail \$1.00—Costs (23 cents). Sold Clear and Rainy Days. No Cloth—No Paste—No Attachment. (1) Rub keeps Windshield clear (48) hours. Experience Unnecessary. NoLife Corporation, Hartford, Conn.

AGENTS \$1. Retail \$3. Your Profit \$2. Wonderful pocket Adding Machine with Magic Writing Pad. Particulars Free. Typewriter Supply, 905 Hersh Bldg., Pittsburgh, Pa.

REPLATE brass worn-off Automobile parts, Reflectors, Bath Room Fixtures, Worn Spoons, Forks, etc., with pure silver. Looks like new. Use U-Kan-Plate Polish. Positively no mercury. \$1.00 half price postpaid. Satisfaction Guaranteed. Agents wanted. Dept. A, U-Kan-Plate Co., Philadelphia.

SELL by mail! Big Profit! Books, Formulas, Novelties, Bargains. Particulars Free! Ellico, 523 South Dearborn Street, Chicago.

SELL Sprayers and Autowashers (100 uses) to Autoists, Garages, Offices, Homes, Factories, Farmers, Whitewashers, Fruit-raisers, Greenhouses, Poultrymen, Gardeners. Unusual profits. Kayrusler Co., Johnstown, Ohio.

COST \$7.50. Your profit \$312.00. Transferring decalcomania letters on autos, trunks, bags, etc. Send today for outfit or free samples. Acme Products, 995 Broad Street, Newark, N. J.

BUILD big permanent business. Toilet preparations, Double Strength Extracts, soft drink powders, other household necessities. Write today. Duo Co., Dept. XI, Attica, N. Y.

EVERYBODY Buys Davis' Nifty Toilet Goods Assortments. Useful, handsome gifts free to our customers. Over 250 high quality products. All repeaters. 100% profit. 25 years of success. Write! Davis Products Co., Dept. 56, Chicago.

PORTRAITS, photo pillow tops, frames, sheet pictures, medallions, merchant's signs, food products, photo jewelry, guaranteed hose, toilet requisites, luminous crucifixes. Catalog 50 specialties free. 30 days' credit. Jas. C. Bailey Co., Sta. C, Chicago.

BIG Money monogramming autos, trunks, bags, etc. Make \$20 to \$25 daily. No experience needed. Samples, information free. Acme Products, 995 Broad, Newark, N. J.

GET Our Free Sample Case—Toilet articles, perfumes and specialties. Wonderfully profitable. La Derma Co., Dept. A, St. Louis, Mo.

AGENTS—Stunning names on Pocket Key Protectors; sample Check with your name and address. 25c. Stunning Outfits, Emblem Checks, Check Fobs, Name Plates. Hart Mfg. Co., Desk 2, 303 Dextraw St., Brooklyn, N. Y.

AGENTS—Steady Income. Large manufacturer of handkerchiefs and dress goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Credit given. Send for particulars. Freeport Mfg. Co., 59 Main St., Brooklyn, N. Y.

AGENTS Wanted—Something new—Fyr-Fxter sells easily. Makes a spectacular demonstration; car owners, homes, factories, stores, practically buy on sight. Our men make \$10 to \$50 a day. Exclusive territory to producers. If you wish to establish a business of your own with unlimited possibilities for making big money, write us today. Fyr-Fxter Co., 998 Fyr-Fxter Bldg., Dayton, Ohio.

POLMET—The Wonderful Polishing Cloth that cleans all metals without liquid, paste or powder. Approved by "Good Housekeeping" and "Modern Priscilla"—sells fast at 25c. Sample free. Gale & Co., Inc., 15 Edinboro St., Boston.

FOR Steady, pleasant income sell old reliable herb medicine. Full time or side line. Makes friends and boosters everywhere. Extra fine commissions. Free box and agency terms. Write Bassett's Native Herbs Company, Established 1879, Dept. E, Columbus, Ohio.

AGENTS—Here's a New One. "Best-ever Powdered Hand Soap." Sells like wildfire. Marvelous Discovery. Removes grease, paint, ink, oil, in fact anything from the hands. Cannot harm skin. 150% Profit. Great Repeater. Agents simply rolling money. "Free Samples Get the Business." Write immediately. Bester Products Co., 1945 E. Irving Park, Chicago.

YOU can be your own boss with our Rev-Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address, 20 cents. Please Die Works, Dept. M, Winchester, N. H.

AGENTS—Send for free sample "Fretnot"—washday wonder. You can clear at least \$20 to \$100 weekly, according to spare or whole time. You don't have to talk; if she doesn't buy at sight, leave sample; she will be looking for you long before you are able to make the rounds again. Samples furnished free. Premiums for your customers. Exclusive territory. Credit given. Empire Specialties Co., 1549 N. Wells, Dept. 101, Chicago.

FREE Booklet describes 52 plans for making \$20.00 to \$100.00 weekly in home or office business of your own. Downs Co., 2323 A Myrtle, St. Paul, Minn.

AGENTS—\$50 to \$200 weekly putting up our Barred Genuine Gold window letters; scripts. Experience unnecessary. Free samples. Premier Letter Co., 121 N. Franklin, Chicago.

300% PROFIT—Quick Seller—Fast repeater. Sample Free. Bester Products Co., 1945 E. Irving Park, Chicago.

AGENTS—Make a dollar an hour. Sell Mendets, a patent patch for instantly mending leaks in all utensils. Sample package free. Collette Mfg. Co., Dept. 401, Amsterdam, N. Y.

MAGIC Polishing Cloth—Great seller. Big Profit. Free sample to workers. Get this proposition. Newton Co., 102 Main St., Newark, New York.

BUSINESS Guide with Free Legal Service. Sells everywhere; Wells cleared \$1,185 in 35 days. Write for free outfit. Nichols Co., Naperville, Ill. Dept. 4B.

STOP selling for others. Make and sell your own products from our reliable formulas. Intense profits. Details free. S. & L. Laboratory, 321 Larimer, Pittsburgh, Pa.

AUTO owner tire agent wanted each locality to use and take orders for hand-made Mellinger fabric and cord tires; guaranteed bond 8,000 and 12,000 miles (no seconds); shipped prepaid on approval; get your tires free; no capital or experience required; make \$100 to \$300 weekly. Write for wholesale prices and sample kit. Address, Mellinger Tire Co., Dept. 300, Kansas City, Mo. or Dept. 400, Philadelphia, Pa.

IT'S The Season's Biggest Selling Hit. Every Car Owner and Garage will buy Auto Mitten Dusters. 200% Profit. Samples Given. National Fibre Broom Co., St. Louis, Mo.

\$5,000 YEARLY easy, selling our money-making specialties; we undersell them all. Catalog free. Samples 25c. Mills Sales Co., 13 East 16th Street, New York.

AGENTS—Large Profits selling United No-Cement Tube Patch. United Patch Company, Canton, Ky.

AGENTS—Write for Free Samples. Sell Madison "Better-Made" Shirts for large Manufacturer direct to wearer. No capital or experience required. Many earn \$100 weekly and bonus. Madison Co., 595 Broadway, New York.

NEW invention keeps window shades clean. Big Profits. Exclusive territory. Boswell-Rauth, Southwest Bldg., Los Angeles.

EARN \$10 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Dele Laboratories, 1134 Broadway, New York.

MANUFACTURE lamb wool polishers, dusters. Newhall, 358 Broad St., Lynn, Mass.

ONE Agent Sold 160 Quick Action Morey Rim Tools in 3 days. Profit \$1.25 tool. Another 13 of 15 demonstrated. For free agents. M. Morey Rim Tool Co., Blissfield, Mich.

KANT-KICK Hand Starter Ford Switch. See Auto Supplies announcement.

AGENTS: Big Money Monogramming by Transfer Method. Catalog Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

AGENTS: Our gold-eyed Needle Cases are wonderful sellers; immense profits; \$50 to \$300 weekly; proof and particulars free; sample outfit 15c; factory prices. Pity Needle Co., 231 Davis Square, Somerville, Mass.

AGENTS—Sell 5c fast selling candy specialties to stores. Big profits. Larrac Products Co., Albany, N. Y.

INSTANT Weld. Repairs largest punctures without cement or heat. Lenn's profit one day, \$58. Write quick. Free sample; territory going fast. Tourists' Pride Mfg. Co., Desk T, Minneapolis, Minn.

MEN with ear to appoint Agents. Liberal proposition. Newton & Co., Second St., Newark, New York.

OVER 100% Profit. Self Lighting Gas and Cigar Lighters; Everybody interested, repeat business. Sell individuals, dealers, subagents. Particulars Free. P. Bernhardt, 127 West 30th St., New York.

350% PROFIT. Everybody buys. Fast-selling article needed in every home. Weener, Box 615, Philadelphia, Pa.

SOMETHING New—"Handy Packet." An attractively put up package of useful household necessities. Positively a sale in every home; fine side line; big profits. Send for sample. Prentice-Lee, 145 East 23rd St., New York.

WONDERFUL! Startling! Amazing! Our Ex-Cel Luminous Crucifix and Marical (Luminous) Necklace shine brilliantly in the dark. Sell on first demonstration. Big profits to you. Write for further particulars, or better still, send for sample and territory protection immediately. Crucifix \$1.50 Necklace \$1.00, postpaid. W. G. Hannan Co., Dept. B, 3539 So. State St., Chicago.

WILLIAMS' No-Water Hand Soap. In tubes, has taken Auto owners by storm; washes dirtiest hands perfectly clean without water; easy demonstration makes quick sale. 150% profit. Williams Co., Dept. 265 Montclair, N. J.

LARGE Manufacturer wants agents. Make \$100 weekly. Outfit free. Sell made-to-measure genuine Cravenette Gabardines, \$14.50. Whitecoats, \$12.50. Reversible Raincoats, \$9.75. Standard Raincoat Co., 16 West 17th Street, New York.

AGENTS wanted to sell to retail Stores our fancy signs; three colors, shaded with airbrush, great variety. C. Polheim, 929 Second Ave., New York.

A \$5,000 A YEAR Job. You can make it worth that and more. 400% to 600% profits selling Perry Photo Medallions. No portraits so desirable. Indestructible, hand-colored, fade-proof. Built from photo supplied by customer. Guaranteed. No money risk. No margin of profit so big in any other line. Write. Perry Photo Novelty Corp., 1793 Jerome Ave., Dept. PM, New York.

AGENTS make \$3.00 an hour taking orders for our 48 Fascinating Kitchen Specialties. No competition. Write quick. General Products Co., Dept. TK, Newark, N. J.

FIBRE Brooms—detachable handles, fine finish. Good profits, repeat sales. The Fibre Broom Company, 117 New Jersey Ave., Brooklyn, N. Y.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

CALIFORNIA Rosebuds selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission Factory PM, 519 No. Halsted, Chicago, Ill.

AGENTS—Clever Invention! Inksoon makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. H. Marul Company, Tribune Bldg., New York, N. Y.

EASY, pleasant work for Mechanics, Shop Men, Clerks, during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, Ohio.

AGENTS—N-R-G Laundry Tablets, the old reliable money-maker for live agents. Millions sold—200% profit—sales waiting for you. Clothes washed spotlessly clean in 10 minutes without rubbing. Free samples. N-R-G Company, 230 W. Superior, Chicago.

GENUINE Gold Leaf Letters anyone can put on Store windows. Guaranteed to never tarnish. Large Profits. Enormous Demand. Free Samples. Write today. Metallic Letter Co., 438-A North Clark, Chicago.

AGENTS \$500 monthly easy selling Magic Gas. New discovery, \$1 box equals 53 gallons gasoline. Proven merits. Your name on cans, 300% profit. Write quick. P. A. LeFevre & Co., Dept. P, Alexandria, Ont., Canada.

AGENTS wanted to sell Men's Hats direct from Factory. Send for Catalogue. Model Hat Mfg. Co., Dept. 5, East Orange, N. J.

ARTICLE costs 5c, sells quickly for \$1.00. Particulars free. Baggs, 3239 Archer, Chicago.

AGENTS—\$240 a month. Take orders for well known line of household specialties, food flavors, toilet preparations, etc. Full or spare time. Build a big permanent business. Must satisfy or money back. Write for free sample Outfit and offer. C. H. Stuart & Co., 5567 Main, Newark, N. Y.

AGENTS make \$100 week placing advertising Cigar Lighters with glass front. Every dealer wants one. Write for free plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

AGENTS—Good salary and commission selling "Ratskill," new rat and mouse exterminator; ready for use; no bait required; non-poisonous; rodents die outside premises; no odor. Empire Specialties Co., 1549 N. Wells, Dept. 301, Chicago, Ill.

MAKE and Sell Your Own Goods. Tremendous profits. No Machinery. No experience. We show you how. Catalog Free. Clover Laboratories, Park Ridge, Ill.

HERE'S The Line That Satisfies. You'll sell yourself on sight. New Rubber Specialties for every purpose. Over fifty fast sellers needed in every home; honest goods that we guarantee and the profits are large enough to give you a steady income and make you stick the year 'round. Write R. & G. Rubber Co., Dept. 890, Pittsburgh, Pa.

AGENTS \$85.00—\$125.00 weekly. One man made \$45.00 one day selling famous Studebaker 21 Jewel Watches direct from factory. Easy Payments. Latest thin models. Outfit free. Full or part time. Write today. Studebaker Watch Co., Dept. A-272, South Bend, Ind.

NOW that you have read all these offers, read Maccolec Company's (Cincinnati, Ohio) advertisement again.

NOW that you have read all these offers, send 25c for Detailed Information (None free) "How" and "What" to Sell by Mail; through Agents; or Direct! We want 100,000 Representatives! Opportunity is knocking—Answer! Surety Service, Desk A3, 551 Harvard St., Rochester, N. Y.

HIGH GRADE SALESMEN WANTED

OUR salesmen make big money because we give wonderful premiums to customers with every order of carbon paper and type-writer ribbons. Sell to offices, factories, banks, etc. Premiums consist of Parker Pens, Brief Cases, Travelling Bags, Cameras, etc. Commissions big and paid promptly. We need a few additional salesmen. Protected territory. Write today for full particulars. Becker & Company, Dept. A, 220 Devonshire St., Boston, Mass.

SALESMAN with car—established line Art Needlework—Straight Commission basis—all territory open. Julian Art Embroidery Co., 136 Greene Street, New York.

NEWEST Invention! Sells everywhere. Automatically prevents telephone and iron cords from tangling and kinking. \$90 weekly. Samples for test if desired. Never-Snap, Dept. 5-1, McClurg Bldg., Chicago.

SALESMEN—Get this big sensational order-getting shirt outfit free. Sell Stylenor Shirts all year round. It's Chicago's Wonder shirt line. Advanced Spring Showing of smartest, snappiest patterns. Large double swatches, low prices, quick service, makes shirt selling easy. Bellard of Texas made \$46.00 in two days. We deliver and collect. Write today for big free outfit. Stylenor, 81 W. Van Buren, Chicago, Ill. Dept. 1104.

EXPERIENCED salesman wanted to take orders for new form of advertising, every firm a prospect, five orders \$10 profit, particulars free. Albert Baxter, Trenton, Tenn.

AGGRESSIVE Salesman with automobile for local territory. Sell oils, soaps, greases to consumers and dealers. Commission basis; payable weekly. Earnings \$100—\$150 weekly. Established 1879. The Phoenix Oil Co., Cleveland, Ohio.

DISTRICT Salesman: Must be reliable. Prefer married man, 30 years old or over, and permanent resident in his community. Exceptional opportunity for good man. Address Dept. 871, William C. Bartlett, Inc., 871 W. Adams St., Chicago.

"REST-A-PHONE" (Dedicated Voice Reproducer) Holds Telephone Receiver during Conversations, Freeing Both Hands. Quick Seller. Large Profits. Sample \$1.50. Rest-A-Phone Company, Atlantic Highlands, N. J.

\$7.00 AN hour actually earned in spare time selling for the largest direct-to-wearer shoe firm in the world. \$5.00 values at \$2.85. Write quick for free particulars. The Doublewear Shoe Co., Minneapolis, Minn.

BECOME Your Home Town's Leading Business Man. Big money. Easy work. Selling groceries, coffee, canned goods, auto oil, men's shirts, ladies' hosiery direct to consumer. Undersell competition. Commission advanced. Liberal credit plan. No experience or capital necessary. Lovell & Brown Co., 1773 So. State, Chicago.

WHY look for a job when you can be in business and start right away. Send 10 cents for a sample copy of Opportunity and find 100 ways to make money. The most remarkable self-helping magazine ever published. 25c on all newsstands. Opportunity Magazine, Dept. P.M., 750 N. Michigan Ave., Chicago, Ill.

DISTRIBUTORS wanted for Mystifying Radio Gas Lighters and Masterlite Clear Lighters. Everybody interested. Sell to consumers, dealers. Big profits. Steady business. Selling Plans free. M. Masterlite Co., 110 E. 23rd St., New York.

SALESMEN. Agents—Every Automobile owner a customer. Sells at fifty cents; regular size for sample twenty-five cents. The Art Co., Taylorville, Ill.

SALESMEN, Agents—Opening for Hustlers in each district, to sell KoverKwik Combination-Coat-Overalls. Just show it and the sale is made. Your opportunity to make real money, where the commission is liberal, and backed by expensive advertising. Write today for our attractive proposition and exclusive territory. We deliver and collect. KoverKwik Mfg. Co., House Bldg., Pittsburgh, Pa.

AN attractive proposition for live-wire Salesmen, selling farm necessity. Universally sold for fifty years. "Sure-fire" money maker. Phillips Mfg. Co., Atlanta, Ga.

SALESMEN Make \$100 Weekly Selling Our New Patented Fandless Automatic Sash Holder. Every Window in America Needs Them! Saves \$5.00 per Window. Mr. Stubbins made \$315.00 first Week. Send \$2.00 for Complete Sample Outfit and Full Particulars. Address Fandless Sash Holder Company, Indianapolis, Ind.

MR. BRUSH Salesmen—Old Established New York Brush Manufacturers require the services of men in all territories to sell their extensive line of Sanitary Twisted Wire Brushes. We pay larger commission than any other Brush House in the country. Write immediately for our proposition. Wire Grip Sanitary Brush Corporation, 15 Mercer Street, New York.

SALESMEN—Selling Supreme Shirts means big business, big repeats, big commissions. Write today for Free Kit. Supreme Shirt Co., 276-nr Fifth Ave., New York.

MINUTES Pay Dollars demonstrating wonderful three pound Calculator. Retail \$15.00. Work equals \$300 machines. Adds, subtracts, multiplies, divides automatically. Five year guarantee. Big demands; large profits, experience unnecessary. Write quick for liberal trial offer and protected territory. Lightning Calculator Co., Dept. F, Grand Rapids, Mich.

SALESMEN—Become Independent. Own Your business, experience unnecessary selling our \$7,500.00 Accidental Death; \$50 Accident; \$25 Sick Weekly Benefit—\$12.50 Yearly. Other amounts proportionate. Guaranteed steady income from renewals. \$250,000 Deposited Insurance Department. Universal Policy, Dept. A, 20 Clinton St., Newark, N. J.

SALESMAN for largest Eastern Tailoring House. Superior line factory to wearer \$29.50 up. Extra trousers free. Large commissions. Complete outfit. N. E. Wholesale Tailors, Harrison Ave., Boston, Mass.

SALESMAN for largest New England House. Suits, sweaters \$22.50 factory to wearer. Largest commissions. Possibilities \$5,000 up. Boston Wholesale Clothing, 47 Beach, Boston.

We Start You in Business. Chemicals, formulas, processes furnished. Every home a prospect. Enormous profits. Information free. Twin City Chemical Co., 65 12th St., St. Paul, Minn.

SALESMEN—Agents, Distributors wanted every city to handle new Ford car necessary; earn \$100 weekly; handle trade, car owner put out sub-agents. Write—Edwards Bros. Co., Dept. P, Leipsic, Ohio.

SALESMEN—Sell Union Made Shoes direct from Manufacturer. Big profits. Easy Plan. Write Geo. Merritt Shoe Co., 720 Assoc. Bldg., Brockton, Mass.

TAILORING Salesman—\$100-\$150 Week selling union hand-tailored, made-to-measure suits, \$23.50—\$29.50. Liberal commissions advanced. Wood & Co., 651 S. Wells, Chicago.

TAILORING Salesmen: Largest line made to order union-label suits, overcoats. Special! Suit or overcoat \$24.50. Extra trousers free! Commissions \$4—\$8 every sale. Big sales outfit free. Scott System, QV Washington St., Boston, Mass.

TIME-SAVER Rubber Half Soles becoming popular as rubber heels. Something new. Big seller. Quick money. Sell on sight all retail trade and direct. Outwear leather. Coat half. User attaches. No nails. Best season now starting. Write today for the Timesaver facts or send forty cents and pencil outline of shoe sole for your pair if you want to get started at once. Timesaver Co., 771 Arcade, Cleveland, Ohio.

TRAVELING Salesmen calling on retail stores wanted by large manufacturer to sell unique line of business-boosting articles. Year round, fast selling, main or side line. If not earning \$150 weekly, address Union Specialty Works, Inc., 222 Charles St., Roosevelt, N. Y.

WANTED—Tailoring Salesmen, make \$60 to \$125 per week. Biggest merchants in many towns have started with our line. We are the largest made-to-measure tailoring house in the country, furnishing elaborate sample equipments, including 500 all-wool fabrics. You make your own profits from \$8.00 to \$15.00 on each order. Guaranteed absolute satisfaction, perfect fit, best workmanship, or no sale. Write for our line and all accessories to be sent free. Tell us all about yourself. Address N. O. Perry, Sales Manager, Box 483, Chicago, Ill.

FOUR \$7.50 sales to merchants net you \$20.00 daily. Sayers Systems, 2803 Sheffield Ave., Chicago, Ill.

REPRESENT us make \$300.00. Association wants outdoor people to become interested. We ranch 1 pair muskrats, for each member, divide increase 2000 from 1 pair 2 years. Wonderful Money-maker. No charge for membership. Booklet, National Muskrat Breeders Assn., South Bend, Ind.

OUR nationally known line of leather goods, calendars, illustrated signs and specialties offers you a real year round opportunity. The Meeker Company, Joplin, Mo.

BIG Profits: 83c every \$1 sale. New Guaranteed Auto discovery. Fast repeater. Specialty Mfg. Co., Boone, Iowa.

SALESMEN—Gold Leaf Window Letter and Script Signs. No experience; 500% profit. Consolidated, 650 South Dearborn, Chicago.

50 MILES on 1 Gallon—Amazing Scientific Gas Saver. All autos. 1 free. Critchley, 8-124, Wheaton, Ill.

SALESMEN. A complete advertising novelty line: Thermometers, Phone Specialties, etc. Liberal commissions—side line or full time. Write Sturwald-Hillson Corp., 2 Tremont Row, Dept. N, Boston, Mass.

YOUR trade uses salesboards. Make up to \$25 on single sale. Largest, lowest priced line. No samples to carry. Elaborate 3-color catalog free. Lincoln Sales Co., Dept. D, 9 So. Clinton, Chicago.

WANTED: Salesmen to sell Toy Balloons and Squawkers to retail stores. \$200.00 per month easy. National Novelty Co., Gallon, Ohio.

WANTED: Salesmen to sell Premiums to Bakeries and other merchants. \$200.00 per month easy. National Premium Co., Gallon, Ohio.

CALIFORNIA Rosebuds selling like hot cakes. Agents getting money. Absolutely new. Big profits. Catalog free. Mission Factory SP, 510 No. Halsted, Chicago, Ill.

WANTED: Salesmen to sell our Men's Wide Belts on 25% commission basis. \$200.00 per month easy. National Molding Service, Gallon, Ohio.

TAKE orders for coffee, sugar, flour, meats, canned goods, staple groceries also paints, radio sets, tires, auto and tractor oils. No capital or bond required. We deliver and collect. Permanent business. Big pay. Write at once. Hitchcock-Hill Co., Dept. 50, Chicago.

SELL for \$9.75. Prints ad on wrapping paper, envelopes, etc. \$1.00 commission. Send 10c for sample work. Automatic Ad-Stamp, Joplin, Mo.

SALESMEN Can make \$5.00 a day selling our Calendars, Pencils, Signs, Advertising Novelties, Yardsticks, Whistles, etc. Liberal terms. Sells entire year. Fine side line. Local and traveling agents. Model Calendar Co., Dept. 226, South Bend, Ind.

STOP! Here It Is! Best Specialty. Sells itself. \$20 to \$40 per day easy. Write for facts. Phillex, 294 Varnum Ave., Lowell, Mass.

\$50-\$200 A WEEK. Genuine Gold Letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 433-B North Clark, Chicago.

EASY Selling Specialty. Beautiful Attractive, Appealing, Luminite Window Bulletin. Increase merchants' business 50% to 100%. Protected territory. \$3 commission on each \$20 sale. Thousands being sold; sells itself on demonstration. Display Products Co., Ltd., A 210W Eighth St., Kansas City, Mo.

IF you think in Terms of \$5,000 the First Year write Us Now. Strong line for retail stores. Nationally advertised. Established concern. Best season now starting. Liberal weekly advance to producer. The Continental Co., 1300 Liberty Bldg., Cleveland, Ohio.

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A BUSINESS of Your Own Pays Best. Men and women are finding rich fields everywhere operating Ragsdale's Original "New System Specialty Candy Factories." Wholesale or retail, all or spare time. Under new plan we furnish everything and teach you fully. Few dollars establishes permanent, big paying business. Valuable Commercial Candy Book Free. W. Hillyer Ragsdale, Drawer 350, East Orange, N. J.

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IF you can sell and you know how to handle salesmen, no matter where you live we will establish you in business. The Investment is ours. Lightning Display Company, 23 East 14th Street, New York City.

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WANT a U. S. Government Job? \$1,140 to \$3,000 year. Become Railway Mail Clerks (Travel—See your country). Rural and City Mail Carriers, Post-Office Clerks, Clerks in Government offices. Steady work. Paid vacations. Common education sufficient. Particulars and sample coaching free. Write immediately. Franklin Institute, Dept. R-3, Rochester, N. Y.

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QUALIFY for \$150—\$300 railroad jobs. Fireman, Brakeman, Baggageman, Sleeping Car or Train Porter. 810 Railway Bureau, East St. Louis, Ill.

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MEN 18 Up. Railway Mail Clerks. \$1,900 year. Sample coaching—Free. Franklin Institute, Dept. R-16, Rochester, N. Y.

MEN wanting forest ranger, railway mail clerk and other gov. positions. Write for particulars. Mokane, R-25, Denver, Colo.

MEN wanting forest ranger positions. \$1,500—\$2,400 year. Write for free particulars of exams. Mokane, R-21, Denver, Colo.

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ARE you old at forty? See our advertisement on page 140 of this issue. The Electro Thermal Company, 2137 Main St., Steubenville, Ohio.

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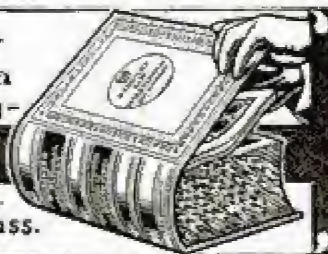
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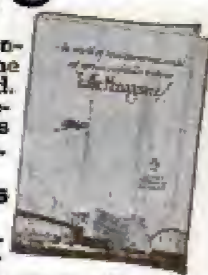
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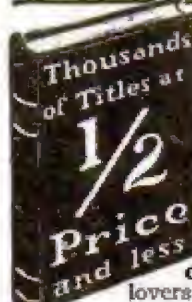
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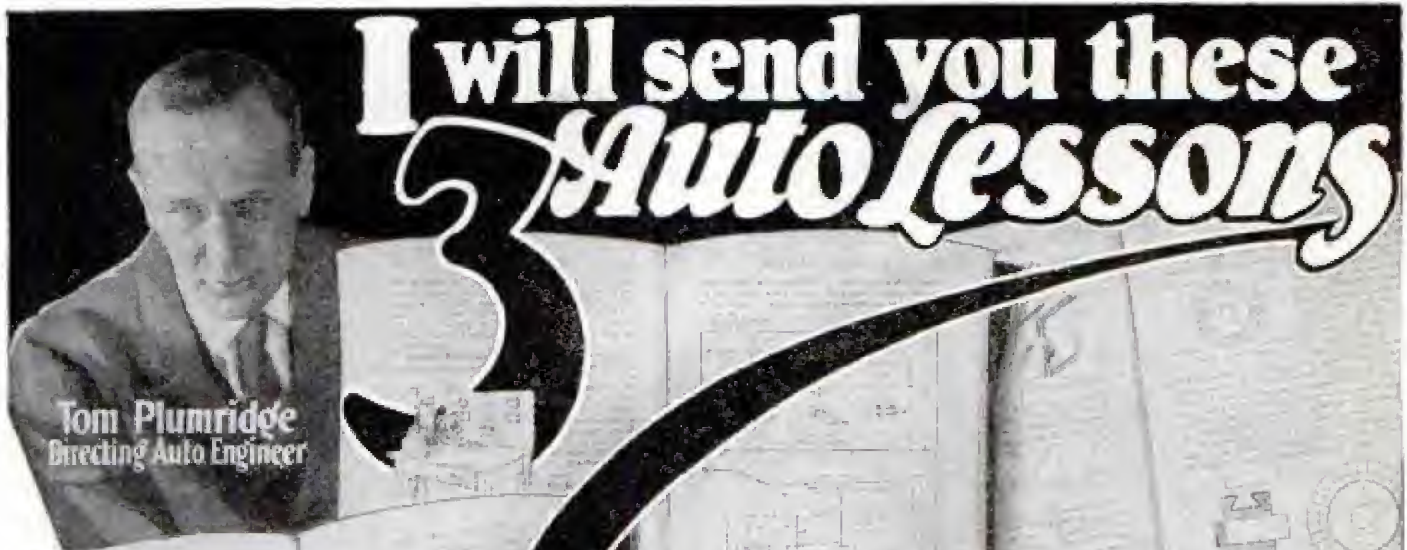


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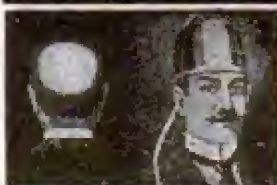
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"Wasn't hard on me at all—noticed improvement the first day—I feel like a new man. It didn't interfere with my work—didn't leave any druggish after-effects—the money I saved in the last two weeks has paid for the treatment alone.

"Why don't you take it! It has cured men like you and me for over forty years—it is a doctor's individual prescription that sure fixes you up. Just send the coupon for full information NOW. No obligation. All correspondence is strictly confidential."

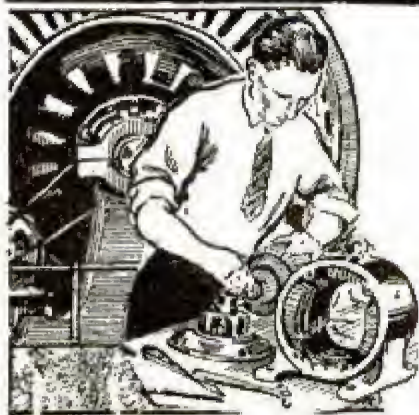
A Doctor's Prescription

The Keeley Institute, Dwight, Ill.

Please send me, without any obligation on my part, your free booklet which will tell me how to rid myself of the tobacco habit.

Name.....
Town.....
Street..... State..... PM-5

How to Get that RAISE in PAY



Make yourself a valuable man the GREER SHOP WAY. Take your choice of these two great fields for big pay and rapid advancement—Electrical or Automotive. Look over the jobs listed below—and remember, the way to start into any of those lines is with GREER SHOP TRAINING. No previous knowledge of mechanics needed. We train you in 12 weeks. Here you learn by actual experience—under expert supervision. Excellent tool outfit free. Free employment service. R. R. fare paid to Chicago on cash enrollments. Send coupon below for full information.



Electrical

Automotive

Electrical Contractor
Up to \$25,000 per year
Electrical Estimator
Up to \$15,000 per year
Maintenance Engineer
\$3,000 to \$5,000 per year
House Wireman
\$1.00 to \$2.00 per hour
General Electrical Repairman
\$1.00 to \$1.75 per hour
Motor and Generator Expert
\$1.00 to \$1.50 per hour
Armature and Stator Winder
\$1.00 to \$1.50 per hour
Telephone Expert
\$40 to \$75 per week
Trouble Shooter
\$40 to \$60 per week
Radio Engineer Unlimited
Power and Sub-Station Engineer
\$150 to \$250 per month
Power and Sub-Station Installer
\$150 to \$250 per month
Power and Sub-Station Operator
\$150 to \$200 per month
Boss of your own shop Unlimited

This School was formerly owned by the U. S. Government Veteran's Bureau—equipped at cost of nearly quarter of a million dollars. When Congress discontinued this course for the veterans, we bought the equipment and installed it in the Greer shops. Other equipment has been added, including a complete, up-to-date radio department.

We have kept the same chief instructor who built up this course for Uncle Sam—the man who started this wonderfully effective system of electrical training.

Electrical opportunities are at their best right now. Act quickly. This coupon brings full information and our extraordinary offer.

Automobile Repairman
\$125 to \$250 per month
Head Automotive Mechanic
\$150 to \$500 per month
Automobile Salesman
Up to \$20,000 per year
Garage Owners
\$300 to \$5,000 per month
Garage Managers
\$150 to \$350 per month
Storage Battery Men
\$150 to \$300 per month
Electrical Experts
\$175 to \$350 per month
Truck and Tractor Men
\$6.00 to \$10.00 per day
Tire Experts
\$150 to \$250 per month
Motor Boat Expert
\$200 to \$300 per month

The record breaking output of new cars is making more demand than ever for Greer trained men. Now you can get this training in 12 weeks or less—that starts you into any line connected with autos, trucks, tractors, motor boats, etc. It would take you many years to get this knowledge any other way.

Here you have actual experience on finest automotive equipment. Individual instruction. You go ahead as fast as you are able. No one is held back because someone else is slow. Advanced students do overhauling, trouble shooting, etc., on customers' cars, under supervision of experts.

This institution has now been in business 24 years. It is one of the very oldest of its kind in the world. In practically every country on the globe, Greer trained men are top notchers in the auto trades. Thousands of them are in business for themselves.

Here is the chance you have been waiting for. **Right now** is the time—when opportunities are better than ever before in automobile history. Send this coupon now and get our big free auto book and offer by return mail.

Don't Wait. Send This Coupon NOW for Full Information. State Which Course, Please

Greer College of Automotive and Electrical Engineering
Dept. 591, 2024 S. Wabash Ave., Chicago.
Please send me full information regarding the course in (check which course):

☐

Automotive
Engineering

☐

Electrical
Engineering

Name.....

Address.....

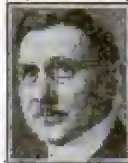
Scenes in the Greer Electrical Shops

Scenes in the Greer Automotive Shops

Money-Making Tools



I need YOU with 100 firms BEGGING ME to send them more DRAFTSMEN. Many offer to take BEGINNERS, at \$50 a WEEK. Graduates can start at \$90 and \$100! GET BUSY!



Drafting is the BIG field, men. Every industry you can name BEGINS with the draftsman. Without mechanical drawings—by the thousands—every shop in the land would be STOPPED.

In fact, it is the **SERIOUS SHORTAGE** of draftsmen that brings this offer: *I will furnish all instruments, supplies, even to the table, to those who start now!*

PAY AS YOU GO Don't give me the excuse that you have no ready money for this golden opportunity. I am not so interested in cash; I want your application. I want at least 200 men to start right now. I want them ready to recommend by Spring! We will get a flood of letters saying "send us draftsmen," from every sort of industrial and engineering concern, and we must make good.

The first week's pay envelope of many a Dobe-trained draftsman has held enough to cover the entire cost of the course! Most students learn evenings, keeping on with their old work until ready to step into somebody's drafting room. The first month equips you to take on simple drafting jobs on the side. It helps you learn; I gladly permit this.

Well-Paid Positions Every Way You Turn

A draftsman soon forgets the days when he used to wonder where to get a job. Instead, he asks "What line of work interests me most?" And "What part of the country suits me best?" Twenty of my graduates went to Florida this year; three are in Japan; last month one wrote me from Ceylon. And I wish we had the count of how many Dobe draftsmen have become chiefs!

Positions loom up almost as soon as you are enrolled in a Dobe class! We receive requests daily for junior men—for men only partly through our course. "We'll take a beginner," some concerns write us, "so long as he is a Dobe-trained man and has begun right!"

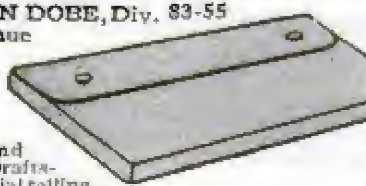
IT'S EASY and interesting to learn drafting. For drafting isn't "drawing"! You don't need any "talent." A draftsman uses tools for every line and every curve. You couldn't make them crooked if you tried! That's why drafting is so easily learned—and so interesting. *For you do everything by rule.* So, I guarantee to make anyone a finished draftsman; if you can read and write, you can learn this line. One of my students is 51 years old; another is just seventeen. *But they'll all be making a grown-up salary by Spring!*

WARNING! The special offer of tools is for immediate action. Don't expect me to hold it open indefinitely. Clip the coupon now for free book:

CHIEF DRAFTSMAN DOBE, Div. 83-55
1951 Lawrence Avenue
Chicago

Special Tool Offer

Send me **FREE** and **POSTPAID** Successful Draftsmanship Book and material telling all about your home course, terms, etc.



Name.....Age.....

Address.....

P. O. State.....

Electricity

A Practical Training

in this great profession will make your successful future a certainty.

The School of Engineering of Milwaukee has specialized for 21 years in training young men for

ELECTRICAL ENGINEERING

With a B. S. Degree in 3 Years

Junior Electrical Engineering—12 months to 30 months, depending upon previous education. Graduates are technically trained electrical experts. Commercial Electrical Engineering—1 year for high school graduates. Automotive Electricity—a 3 to 6 months' course will make you a highly paid specialist on all types of starting, lighting and ignition systems. Armature Winding—and Motor Generator Repair—thorough 3 months' course. House Wiring and Meter Testing—3 months' course. Practical Electricity—6 to 12 months' course to become a Master Electrician.

We will Aid You Earn Your Way Partly Through College, through our practical plan of co-operative industrial employment. Board and room at cost. Student activities, orchestra, daily broadcasting WSOB.

NEW TERM OPENS MAY 10th. Write NOW for latest catalog and full details. Mention age, education and course of interest.

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Milwaukee, Wisconsin

Catarrh, Etc.



Mucus-making foods cause catarrh of the eyes (conjunctivitis), of the nose (rhinitis), of the ears (otitis, deafness), of the tonsils (tonsillitis), of the bronchial tubes (asthma), of the lungs (tuberculosis), of the stomach (gastritis), of the appendix (appendicitis), of the bowels (colitis), of the gall bladder (gall stones), of the gums (gingivitis—pyorrhea), etc. Instruction in selecting nutritious but mucus-free foods. Sworn statements.

Educational Booklet 10c. **BRINKLER SCHOOL OF EATING**, Dept. 42, 131 West 72nd St., New York.

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FREE 35c Popular Song with Ukulele Accompaniment to the first 500 who answer. Write right now. A postal card will do. **INTERNATIONAL UKULELE CLUB** Dept. M 114 W. 44th St., New York, N.Y.



Take Your Profit From Now On

300% advance on Crude Rubber drives Mr. Car owner to have his Tires repaired, instead of buying new ones.

EASY TO LEARN

We give you instructions Plants \$100 and up

Our free Catalog tells you how to save 50% on a plant we have near you. Instruction Book for a \$1.00 bill.

Equipment Exchange, 118 E. 11th St., Los Angeles, Calif.

Rheumatism

"Received greater benefit from Vit-O-Net than from treatments costing \$1600.00" writes a Rheumatism sufferer. Write for information regarding amazing results secured with Vit-O-Net Electro-Magnetic Blanket. Thousands have secured relief by this method. Endorsed by hundreds of physicians and hospitals. **REPRESENTATIVES WANTED.**

Vit-O-Net Mfg. Co., 4105 Ravenswood Ave., Desk 6, Chicago

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At last the ideal way to heat your home, without coal or wood, has been discovered. This is a new invention called the "Heat Fountain" which converts any stove, heater, range or furnace into a gas heater. It combines ordinary kerosene (coal oil) with air to have a perfect heating gas. No piping—no changes to your present heating plant necessary. Simply slip this little device into any stove or furnace and you have instant heat, any degree desired, at a turn of a valve. Already 200,000 homes, many of them in Canada and Alaska, have found this wonderful device the most dependable for heating even in sub-zero weather. Find out now how you can be done forever with soot, ashes, dirt, smoke and drudgery of coal and wood—the worry of coal shortages, strikes and exorbitant prices. Find out how you can use this new invention in your home on 30 days' trial. Simply write for free book "The New Way to Heat Homes" and full details of our offer. Send name and address to

OLIVER OIL BURNER CORPORATION
Dept. E-130 210 Chestnut St., ST. LOUIS, MO.

Be a BIG-MONEY Wage Earner with \$10 to \$15 a Day in Your Pay Envelope LEARN BRICKLAYING

\$1.50 an Hour

Just a line to let you know how things are going. I am working on the Hudson Building and getting along fine.

It is a Union job, but I got a permit from the Union to work. I am getting \$1.50 an hour, and it seems like getting money from home.

Thanking you and Mr. Woods for what I have gotten from your School, I remain,
(Name on application).

The Highest Paid Trade

We Can Help You Make the Same Big Success That These Men Did

Two years ago, a young Hollander, working at common labor, entered the A. B. E. School and took our course in Bricklaying. He went out to work, saved his money, and about a year after he finished the school he went into business for himself. He now employs 12 to 15 men.

Another one of our graduates dropped in the other day to tell us he had earned \$571.25 the first two months after leaving the school and is now a full fledged

member of the Union. We have dozens of letters on file from men we have instructed in bricklaying.

They all tell of making good on the job, steady work and big wages.

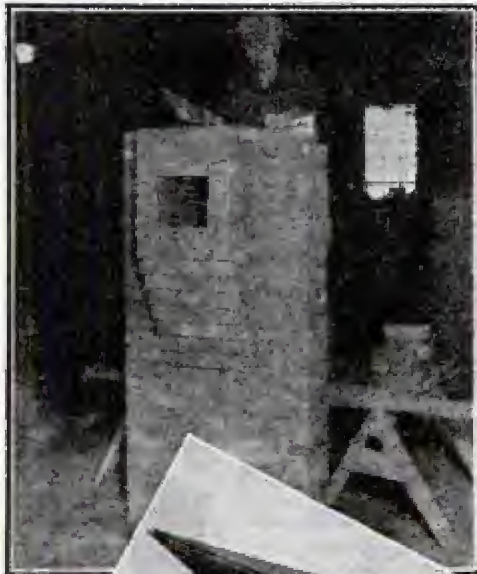
Why fritter your life away at a small pay job. If you are in a rut, get out of it by learning a man's trade. If you are just starting your working life, have a trade that will earn your living any time regardless of how far you go in the business world. If you have struggled under the limitations of common labor or poorly paid jobs, it is not too late to learn this trade, which will give you freedom. Men as old as 55 have been to our School, and made good.

Steady Work at \$1.25 an Hour and Up

I took your course during the winter of 1923 and 1924, and have had continuous employment since at no less than \$1.25 per hour, and sometimes more. I can safely recommend the A. B. E. to anyone desiring to learn a good trade, and will at all times refer my acquaintances to your school.

Again thanking you for the benefits received from attending your School, I remain,
(Name on application).

YOU CAN LEARN BRICKLAYING



at home in your spare time or you can learn it at our School in Grand Rapids, or you can combine the two.

Our School in Grand Rapids has been in operation over three years, several hundred men have been trained in it, and we have now developed a most amazing, unique and simple method of home training. You can't learn brick work out of books. Your hand and your head have to work together. And the A. B. E. Course has no book work, except simple definite instructions of things to do. Months of study has developed a plan of visualization which enables the student, even though he is a thousand miles from the School, to see what he is to do, so as to enable him to do it, and when it is done, to have it done right. Bricklaying is a complicated art; it has endless variety; it calls on a man's creative ability, and the A. B. E. Manual method of instruction through models and illustrations, gives him a complete knowledge of Bond which is fundamental for successful bricklaying, trains him in the correct use of the trowel and spreading mortar, and carries him through every form of brick work by means of charts and models. The student uses actual materials and does actual work, having first built in miniature the things he creates in brick. The student can get more actual technical training in bricklaying, a wider and broader knowledge of brick work in this Course than in years on the wall.

He qualifies for this trade in months instead of years.

Never Before a Bricklaying School Like This —Run by Building Contractors

We started the A. B. E. School to train bricklayers for our own members. The School was so successful that we enlarged its facilities to extend our training to men everywhere who are eager to rise from the ranks of the untrained. Men from 14 States are in our School in Grand Rapids now. The home course was established to care for hundreds of young men who cannot finance a complete course in Grand Rapids. We have put it within the reach of every man to become a bricklayer, taking the entire course at home, the entire course in our School, or a part at home and a part at School.

You Sign No Contract

is reasonable. The student pays as he goes.

Write Quick for Catalog

Write for our complete plan. How our trained men are making top wages. How we help our men find work. You are face to face with a real opportunity. Clip the coupon—NOW—while the matter is on your mind, and get the free catalog.

Associated Building Employers of Michigan

E-410 A. B. E. Building, Grand Rapids, Mich.

Associated Building Employers of Michigan,
E-410 A. B. E. Building, Grand Rapids, Mich.

Send me your free catalog on "Learning Bricklaying," telling all about your practical home instruction in bricklaying and the success made by men trained in the A. B. E. School.

Name

Address

City

The Brick
in this house
laid by A. B. E.
Graduate





ROBERT DAWSON
President

I HAVE MADE MORE THAN **\$3,000** IN ONE Month In the REAL ESTATE Business

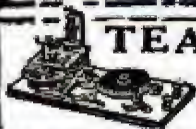
I made this in commissions, selling Real Estate for others. I will tell you how with little capital and no experience you can get into this big paying business. How, with less than \$25.00 I started a business that made me more than \$12,500.00 in one year. No business, trade or profession offers such big returns.

I Teach You Thoroughly By Mail. I have arranged my course to present the subjects of Real Estate Insurance and General Brokerage from every angle. The Chain Store idea has astounded the commercial world by opening the doors to profits unheard of. I have applied the chain idea to my business. You can become a link in this chain which will be one of the most powerful of its kind in the world. Write for FREE booklet.

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to trained men and women; we train you by mail; get 20 years' hotel experience in few months; earn \$3,000 to \$10,000 a year; fine living; work is fascinatingly interesting; quick advancement. Send for FREE BOOK today!
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Hernia, commonly called rupture or breach, and many other serious conditions, such as general Enteroptosis, are brought about by a Myoptosis—in this case a relaxation of the abdominal muscles, sometimes to the extent of Myo-atrophy. When the abdominal walls become thus affected the blood vessels become constricted and the circulation is impaired—the wearing of improper support usually aggravating the condition. **STUART'S PLAPAO-PADS** are a newly patented mechanico-chemical self-adhesive device, designed to aid in supporting the weakened muscles and keep them in a proper position, so that the blood vessels will not be constricted. The circulation being re-established, and the blood being brought through the parts in increased quantities by the adaption of "plaster therapy," the muscles recover their tone and power of contractility, and when restored to their normal strength and elasticity, of course, the resultant troubles naturally disappear. **No Straps, Buckles or Springs attached.** Awarded Gold Medal Rome, Grand Prix, Paris, and Honorable Mention, Panama-Pacific Exposition. Thousands of ruptured people have instructed us to make the Plapao-Pads and they have used them at home and report the maximum success in conquering some of the most stubborn cases. Soft as velvet—Easy to apply—inexpensive. Patent allowed in U. S. and foreign countries.

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SELL BY SCIENCE YOURSELF GOODS AND WIN SERVICES

WHATEVER, whoever you are, you sell. Man or woman—you dress, talk, act all the time to sell others on YOU. The clergyman sells his flock on religion. The "stenog" sells her boss on her services. The agent sells his firm and line. The young man sells himself to "the only girl in all the world". Life is SELLING. Selling is LIFE. How you sell makes or unmake you. To sell successfully you must

KNOW YOURSELF THE OTHER FELLOW

You must be able to "size up" people; to know types, know their vulnerable points; know when they're being sold; know the instant you've killed a sale; know the way to revive it. You must know the "wants-to-be-sold" person, know when the mind thinks "yes" though the mouth says "no"; know how to increase your sales energy and intensity in an instant.

\$OS — Short Cut to Experience. Hargrave's Secrets of Selling is proven sales knowledge—laws on yourself and the other fellow—which tell simply, without bandying words: what, when, why and how to do it to swiftly increase sales, income, success. Not a person who won't sell his or her self, service or goods better immediately by absorbing and applying S. O. S.

Send for this Amazing Book: the powerful story of S. O. S., "The Third Vest Button" and a wealth of startling selling revelations. No obligation whatsoever.

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They Say:

"I more than doubled business after reading your first S. O. S. articles"—from an Iowan.

And a man from Ohio: "Am deriving 100 per cent more business since applying S. O. S."

"The knowledge I have gained from your service has had a great deal to do with my starting in business for myself," writes a man in Minneapolis.

Names and Addresses on request.



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Select from 44 Styles, colors and sizes, famous Ranger bicycles. Delivered free on approval, express prepaid, at Factory Prices. You can easily save \$10 to \$25 on your bicycle. Prices \$21.50 and up.

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Tires best quality, at factory prices, express prepaid. Lenses, wheels and equipment, low prices. Send No Money, do business direct with makers.

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Air-cooled—Water-cooled. One-half H. P. in 15 pounds. Handiest little engine ever made. Ideal wherever power is needed. Also the Metalum Model Airplane Engine, one-half H. P. in 2 1/4 pounds. The market demands them in thousands. Generous agency propositions on request. Complete line of small gasoline and steam engines, battery chargers, etc. Catalogue Free.

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Who Can Qualify

\$1400 to \$3000 Is Pay

Men who are looking for good, safe, steady, well-paid positions are urged to get in touch with Arthur R. Patterson. He will tell you about the finest positions in the country—jobs that give you better opportunities and quicker advancements than is possible in the work you have now. Work in the Civil Service. Jobs at home, Washington, Panama Canal, or travel. Up to 30-day vacations and up to 30-day sick leaves, in some branches. Automatic raises every year until top pay is reached. Write quick for information. Address Arthur R. Patterson, care of Patterson Civil Service School, 85 Wisner Building, Rochester, N. Y.



Does \$5,200 a Year Look Like a Mountain?

Here's a peculiar thing about salaries.

To the man making only \$20 a week, "\$40-a-Week" looms as big as a mountain.

But he reaches it, let us say.

Then "\$80-a-Week" becomes the height beyond which he hardly dares aspire. His little old "\$40-a-Week" looks small indeed!

Eventually—thru home-study training, if he is wise—we will say that he attains his \$80 salary.

When, lo and behold, that distant peak—"S100-a-Week"—becomes no higher than a foot-hill! He wonders why he should ever have thought it utterly beyond his reach!

Start Now—by Doubling Your Salary

Never mind what you're making now. What would you LIKE to make?

Set your goal at \$5,000 a year—\$10,000 a year, if you like—and bear in mind the fact that mole-hills are frequently mistaken for mountains.

Then read the following statements from LaSalle-trained men, and you will understand why YOU, TOO, CAN QUICKLY INCREASE YOUR EARNINGS:

"LaSalle training has taken me from the \$85-a-month class to a present earning power of over \$7,000 per annum."

"Just received another raise of \$600. This makes a total gain of over 400% since I started training."

"Within a period of three years LaSalle training has increased my income from \$250 a month to \$6,000 a year."

We do not promise anyone an immediate leap from \$20-a-week—or \$40-a-week—to \$10,000 a year. Advancement is rarely won that way.

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If you have the will and the purpose to succeed—fill out the coupon, clip it, and place it in the mail TODAY.

— Find Yourself Thru LaSalle! —

LASALLE EXTENSION UNIVERSITY
The World's Largest Business Training Institution
Dept. 564-R Chicago

I should be glad to learn about your salary-doubling plan as applied to my advancement in the business field checked below. Send also copy of "Ten Years' Promotion in One," all without obligation.

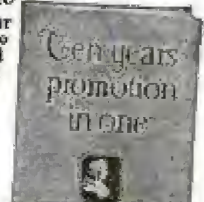
- ☐ Business Management
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- ☐ Commercial Law
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- ☐ Modern Business Correspondence and Practice
- ☐ Expert Bookkeeping
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Name.....

Present Position.....

Address.....

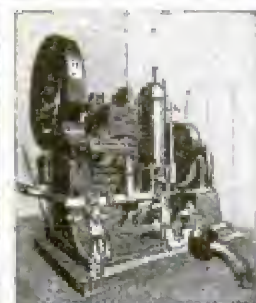


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MILLER
Director
Extension
Work
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School



The American School

A million Dollar No-Profit Educational Institution, now offers men a double service—training for a specific job, then help finding the job. For one small price, on terms of only \$5.00 a month, you are now assured of definite benefits, both in position and salary. Write for complete information—today!



No machine can be built until the Draftsman first builds it on paper. My training prepares you for this work.



Never has the world seen anything like the building boom of today. This has created enormous demand for real Draftsmen.

5 BIG-PAY Branches

The big money in Drafting goes to men who specialize in Machine Design, or Electrical Drafting, or Architectural Drafting, or Structural, or Automotive. It is not enough merely to know general Drafting practice. You must know how to calculate and design and plan original work. You need many Engineering subjects to fill the kind of a Drafting position that pays \$60 to \$125 a week. The American School now includes this specialized training in its Drafting course.

Costly Drafting Outfit Given!

Fine, imported instruments like these help you learn Drafting quickly and easily. These standard quality, full size instruments, board, table, triangles, T square, ink, protractor, etc., given to every student without extra cost.

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AMERICAN SCHOOL

to prove you can

We have invented a new, simplified way to teach Drafting—the first real improvement in Drafting home instruction in history. We want you to see a few of these new Job-lessons, try them, test your own ability to master them—without one penny of cost or obligation. For instance you will see how we get away from the "copying" methods used in the past, so you develop into a DRAFTSMAN, instead of a "tracer." See for yourself the ingenious new method which compels you to think, to solve problems, to do actual Drafting-room jobs from the very first lesson!

A New, Rapid, Simplified Training

Copying drafting lessons prepares you to be only a "tracer." This new "Job-Method" gives you actual drafting-room jobs in a new one-step-at-a-time way. With pictures which you can understand almost without reading the "lessons." And that is why the American School-trained Draftsmen can qualify for a good job at big pay when they graduate.

Win Success Thru Drafting

Drafting is easy, fascinating work. Short hours. Big pay. And the Draftsman is always in line for promotion to executive positions. This training is complete. It includes high school subjects (if you need them) and all the Engineering and Mathematics Drafting experts require.



FREE Job Service!

The American School now offers its students and graduates, without cost, the services of an efficient employment department keeping in constant touch with employers of Draftsmen all over the U. S. We have placed hundreds of men in good, big-pay Drafting positions. We've made this training so complete, so practical, so easy to master, that our students are bound to make good. And so, because the demand for real Draftsmen continues to exceed the supply and because this training actually prepares men for good Drafting positions we back it with a Free Employment Service.

Dept. D-574

Drexel Avenue and
58th St., CHICAGO

Lessons Actually FREE

learn at home in spare time!

Draftsmen Wanted!

\$60 to \$125 a Week!

yourself. Plan your future in Drafting. Even if you have only common schooling, even if you know nothing of Drafting, we guarantee to make you a real Draftsman or to refund your money! Special surprise offer right now to the first 500 men who answer this ad—reduced price, easy terms. Coupon brings complete information.

70,000 fine jobs advertised last year. Get ready to fill one. Get out of the rut. Make something of

I Will Make This Contract With You



American School
—the Million Dollar
Educational Institution



4. or we'll refund every cent of your money.

WHEN you enroll for our home-training in Drafting, we agree to give you:

1. Complete Drafting training, by the new Practice-Method.
2. Professional Drafting Outfit, as illustrated.
3. We will help you get a good Drafting position at a substantial increase in pay.

O. C. Miller

**Coupon
Brings 3 Lessons FREE!**

Get them. Test your own ability to learn Drafting and get ready for a fine job and big pay.

Coupon also brings surprise offer, and complete information about your opportunities for success in Drafting. Mail it Today!

Read These Letters!

City of Chicago
Department of Buildings

Gentlemen: The same day I received my diploma I got word that I was one of the two candidates who had successfully passed the examination for Deputy Commissioner of Buildings of the City of Chicago, a position paying \$3600 per year.

There were eight applicants examined besides myself, all men well known to the architectural and engineering profession. Seven of these failed to obtain a passing grade of 70%. My grade was 84.69.

Inasmuch as I failed to pass this same examination three years before, my present success is mainly due to the knowledge gained through your School.

Yours very truly,

ROBERT KNIGHT

Got His Draftsman's Job

"I wanted to let you know how I came out in getting that job at the Brownell Co., Dayton, Ohio. I was to start and have a trial at Drafting, and I am still in the Drawing room. The engineer seems to like the work I make, and also the other draftsmen. I thank the School very much for getting me in at this place, because your letter of recommendation helped me a whole lot to get the job."

BERNARD WEBER,

730 St. Nicholas Ave., Dayton, O.

Liberty
High School
Bethlehem, Pa.

Dear Sirs:—This is to thank the American School for all that you have done for me since I signed up for the Drafting and Design Course.

In the eight years since then, I have gradually climbed from the position of tracer to that of Head of the Department of Machine Drawing and Design in our magnificent new \$2,000,000 High School here, at many times the salary which I received at that time.

The officials of the Pennsylvania State Department, and Dr. Wm. C. Ash of the University of Pennsylvania, all claim that our course in Drafting and Design is the best now being taught in this state. Every drafting graduate that we have turned out has proved successful, and one is now Chief Draftsman in a local steel concern.

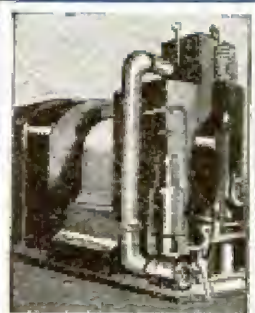
Yours Sincerely,

J. S. LEAR

Has Charge of Large Jobs

"Even before I had finished my course, I was put in charge of large construction jobs in different cities. I have been doing that ever since, and the job is getting larger all the time. I owe my success to the American School because of the knowledge I gained in mathematics and calculations."

ELMER L. LAMB,
1806 Smith St., Peoria, Ill.



Electricity needs Draftsmen who know Electrical principles as well as general Drafting practice. I give you this training.



The demand for Draftsmen experienced in concrete and structural steel work is enormous. Many big-pay positions open.



Every great Auto Factory employs Draftsmen who specialize in Automotive work—men who design bodies, glass engines, etc.

3 Drafting Lessons Actually FREE

O. C. MILLER, Director Extension Work
AMERICAN SCHOOL

Dept. D-574, Drexel Ave. and 58th St., Chicago

Rush 3 Free Drafting Lessons, Job and Raise Offer, complete information, money-back guarantee, etc., to prove I can become a real Draftsman at home in spare time.

Name.....

Street No.....

City..... State.....

Quickly Learn to Play Hawaiian Guitar

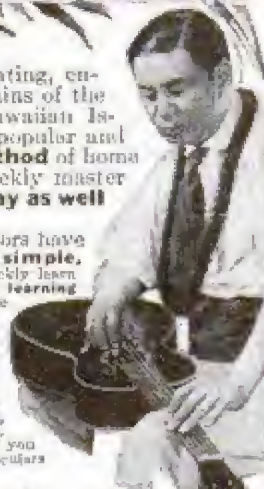
Play Like This Native

Bring the romantic, enchanting, entrancing and melodious strains of the great instrument of the Hawaiian Islands into your soul. Become popular and successful. This **short cut method** of home instruction enables you to quickly master Hawaiian Guitar so you will play as well as **Native Hawaiians**.

Our staff of Hawaiian instructors have perfected a method of teaching, so simple, that without musical knowledge, you quickly learn to play real music from notes. Simple as learning your A, B, C's and it will not be long before you will play latest Broadway hits.

Only four simple motions to learn. You will then play any music, whether it be popular, dance or classical. Almost from first lesson, you play love songs like Aloha Oe.

To help you get started, we furnish free when you enroll as a student, a beautiful, full tone, genuine, \$18.00 Hawaiian Guitar. Only 1,000 free instruments given away if you want to get in on free offer, write for particulars at once—you must act quickly.



New Invention—

Kno-All-Chart
QUICKLY TEACHES
YOU HOW TO PLAY

The newest invention of our Hawaiian instructor, which is exclusively used by us and which we call the "Kno-All-Chart," quickly

teaches you how to play and read notes. So simple is this device that any one can understand it and begin to play immediately.

Picture Method Easy

Free
18 Hawaiian
Guitar when
you enroll

We do not depend upon our printed instructions alone for your success as a student, but we also supply you with many pictures of our professors playing. This enables you to imitate the pictures. Isn't this easy?

Phonograph Records FREE

As an additional guide, we also furnish you with phonograph records of our Hawaiian instructor's own playing of the pieces you are learning. This practically brings our professors from our studio to your own home and enables you to listen to their playing just as if they were actually in front of you.

Genuine \$18.00 Hawaiian Guitar Free

Enroll as a student, and receive free, a beautiful, full tone, genuine \$18.00 Hawaiian Guitar. We also furnish every bit of equipment so it is never necessary for you to spend an extra penny. When you graduate, you get a beautifully engraved diploma and after graduation, we also give you six months' free service and consultation. Send for free particulars now.

JAZZ

Your Way to
Popularity and
Success

No forming class to wait for. Start at once and join band wagon of success and popularity. Do it through Hawaiian Guitar.

Send for free First Lesson

and Book. So positive are we you will become one of our students, that if you write at once, we will send you free, our first lesson which will enable you to see just what you can expect when you enroll. You will also receive our big book of 100 pictures. Write for your copy and free lesson today.

Write at once. **Hawaiian Studio No. 525**
of New York Academy of Music
100 Fifth Ave., New York, N. Y.

HAWAIIAN STUDIO No. 525
of New York Academy of Music
100 Fifth Avenue, New York, N. Y.

Please rush your book, "How to Learn Hawaiian Guitar" and my first free lesson. Also reserve a gift Hawaiian Guitar for me. This obligates me in no way whatever.

Name

Address

City State



Charleston!

Everybody's doing it! Arthur Murray, world's greatest dancing teacher, has invented a remarkable new method which enables anyone to learn all the newest dances at home—in a few hours—at very little cost! No music or partner needed. Success positively guaranteed! "300,000 learned dancing by mail."

FREE! 32-Page Book and TEST LESSON

To prove you can learn easily and quickly, Arthur Murray will send you his 32-page book and Test Lesson FREE. To cover mailing, please enclose 10 cents. Act NOW and be a good dancer soon.

Arthur Murray
7 E. 43rd St.

Studio 634
New York City

\$75 A WEEK BUILDING RADIO SETS

—in your spare time

Join the Radio Association of America. Let it train you to build and repair sets, to be the "radio doctor" of your community. \$3 an hour easily made in spare time.

\$500 Earned in Spare Hours

Lyle Follick, Lansing, Mich., writes: "I have already made over \$500 in spare time." He is just one of many. Our members are starting radio stores, securing better positions, passing radio operator examinations, qualifying as big-pay Radio Experts, as well as making money spare time.

Join the Association now!—It's our special Plan your membership need not cost you a cent. Number of these memberships limited. Write for details NOW!

RADIO ASSOCIATION OF AMERICA

Dept. A-5, 4513 Ravenswood Ave.

CHICAGO, ILLINOIS

Big Money in Poultry



Eggs Turn into Dollars FAST!

Make \$1,000 a Year in Spare Time—Easy

Lots of room for YOU in the poultry business. 85% of the people of this country live in cities. EVERYBODY eats eggs and poultry meat—but only 15% produce them. Why not let the "other fellow" pay YOU the fancy prices? Easy to get started in back yard, on vacant lot or farm. We GUARANTEE success if you follow our methods. We show you how to feed for eggs in winter, when eggs are high in price; how to cut feed bills; how to keep flocks healthy; how to tell laying hens, PAY-BIRDS, from loafers. Our course, produced by eighteen famous experts, endorsed by 30 leading agricultural schools, gives you thousands of sure, proved, tested methods that make PROFITS CERTAIN. FREE book tells what we're doing for others—and what we can do for you.

Others Say:

"You have opened up to me a pleasant and profitable way of gaining an independent living."

Seldon Anderson, R. 1

"When I enrolled for your course, I knew nothing about poultry keeping. I am now successfully operating a commercial poultry farm."

W. J. Warthen, Conn.

"Your course was a splendid investment. I recommend it for both business and experienced poultrymen."

Y. W. Os, Hawaii.

MAIL COUPON TODAY

Mail this now

The National Poultry Institute
Washington, D. C. Dept. 400-K

I am interested in your plan on "How to Raise Poultry for Profit." Send me your FREE book, without obligation on my part.

Name

Address

500 Quarts of Fire Gas

from One Quart of Liquid



A new kind of gun—a fire gun—amazes everyone who sees it. For when a little valve is released 500 quarts of fire-destroying gas is produced from one quart of liquid. You can actually stand 25 or 30 feet away from a fire and by directing this stream of liquid at the base of the fire it quickly smothers the flames with its blanket of gas.

No Pumping

One of the most remarkable features of this new fire gun is that it requires no pump like old-fashioned fire extinguishers. Consequently, it does not jam or get out of order in the emergency of fire. All you have to do is to turn a valve and hold the gun steady. You can hit a spot no bigger than a quarter; quite different from the pump gun that is bound to weave and splatter with every stroke.

Harmless, Stainless Liquid

Yet, with the amazing power of this gun to put out fires, it is absolutely harmless to human beings. You can turn its spray directly on furniture, rugs, draperies, clothing and furnishings without damaging them one bit—without even leaving a stain. Think what a great thing this wonderful invention makes for homes, offices, factories, schools and all other buildings. An instant protection against fire—one that is absolutely harmless and can be used by a child—one

that puts out every kind of fire including celluloid, gasoline, kerosene and other fires that water only makes worse.

Agents, Salesmen Needed

The *inventor* of this wonderful gun wants salesmen, agents and spare time workers in every part of the nation to demonstrate it and is willing to pay them well. Already thousands of these guns have been sold and other men are making \$200 a week in full time and \$50 to \$100 a week in spare time.

Besides giving you free territory and free selling outfit, the inventor of this gun will furnish to producers free automobiles so that they can cover a bigger territory and make more money. By writing quick you will get full terms of this amazing offer.

**AGENT MAKES \$131
IN ONE DAY**

Automobiles Furnished Producers

Mail Coupon for Free Selling Outfit Offer

Do not hesitate a day. This wonderful invention is doubling and tripling the earnings of other men. La Barr actually made \$131 in one day. Clement

made \$67.70 in one day. McPhail made \$1,140.10 in four months. Even if you can only work in spare time here is a wonderful opportunity to make \$5, \$10 or \$20 a day extra. Simply mail coupon below and you will get full details of this amazing new product and our offer to representatives. Get the coupon in the first mail.

WELDON MANUFACTURING CO.
DEPT. 7-E GRAND RAPIDS, MICH.

WELDON MANUFACTURING CO., Dept. 7-E, Grand Rapids, Mich.

Send me at once full details of your amazing new fire gun and how I can get your free selling outfit and free territory. I am not obligated.

Name.....

Address.....

City..... State.....

NEW FORD TIMER

GUARANTEED *for* 3 YEARS

Entirely New Principle

Study the illustration and you will note the rotating member is the brush principle traveling on the outside surface of the commutator—this assures you of a steady, even and powerful spark at exactly the proper time—The natural centrifugal action of the rotor keeps the commutator clean as it should be—provision is made for the elimination of any oil, grit or grime, therefore it cannot accumulate in the WEEKS SUPER TIMER. This principle is entirely new and unique.

Sensational Invention

Millions of Ford Owners have been waiting for this SUPER TIMER—does away with common TIMER troubles. Entirely new principle. DYNAMO TYPE, no heavy pressure contact, no rollers to wear flat and cause endless trouble; smooth, easy, positive contact. The faster you run the hotter the spark, positive contact at all times, short circuits impossible, no oiling necessary, perfect firing, gives more power, saves wear and tear, adding many extra miles to the gallon, instant starting in the coldest weather, the motor promptly responds to the hot spark, the pick-up is marvelous. No parts to wear out, and the fact that the SUPER TIMER OUTLASTS 6 ORDINARY TIMERS enables us to guarantee this TIMER for 3 years.

Ford Owners Wild Over It

Beyond a question of a doubt the most needed article on a Ford today is a GOOD TIMER, one that would accomplish a real purpose and serve the owner—without continual care and attention, annoyance and trouble. The "SUPER" TIMER is the latest achievement of Mr. Weeks whose zealous interest is to make each and every Ford Owner the proud possessor of a better running Ford. Already the "SUPER" TIMER has met with instant approval. Ford Owners everywhere generously acknowledge it to be the BEST TIMER on the market. It is indeed a real TIMER for Fords.



Fortunes Now Being Made

Every Ford Owner knows the value of a good reliable TIMER on a Ford. He has been accustomed to continual trouble—THE ORDINARY TYPE OF TIMER means nothing but trouble—THE PRINCIPLE OF CONSTRUCTION HAS BEEN WRONG—The SUPER is built on the DYNAMO TYPE—which in itself means uniformity, regularity and long life—When you consider the Big Fortunes now being made in the Ford Field you will realize the big opportunity this proposition offers you—an all-year-round seller—with tremendous profits.

MAIL TODAY
WEEKS SUPER TIMER COMPANY
426-711 Eleventh St., MILWAUKEE, WISC.
 Gentlemen: Kindly mail me full free information about your wonderful invention.

Name.....

St. or R. F. D.

Town.....

County.....

State.....

Be The First in Your Locality—

Its low cost makes it easy to sell and as our advertising campaign will bring in many requests for territory it is greatly to your advantage to act now—will send sample for trial.

Weeks Super Timer Co.

426-711 Eleventh St.

MILWAUKEE, WISCONSIN



"The little wrinkle that makes my 'B' batteries last longer is using the right size Evereadys with a 'C' battery"

"I USED to think that because the Eveready 'B' Battery No. 772 cost less than either of the larger Heavy Duty Evereadys that I was saving money. As a matter of fact, on four or five tube sets, that was false economy.

"The right size Eveready 'B' Batteries to use depends on the number of tubes in your set. The life of the batteries depends on how much you listen in and on whether a 'C' battery is employed."

To get the maximum of "B" battery life and satisfaction, follow these simple rules:

On 1 to 3 tubes—Use Eveready No. 772.

On 4 or more tubes—Use the Heavy Duty "B" Batteries, either No. 770, or the even longer-lived Eveready Layerbilt No. 486.

*NOTE: A "C" battery greatly increases the life of your "B" batteries and gives a quality of reception unobtainable without it. Radio sets may easily be changed to permit the use of a "C" battery by any competent radio service man.

On all but single tube sets—Use a "C" battery.*

Follow these rules, and No. 772, on 1 to 3 tube sets, will last a year or more; Heavy Duties, on sets of 4 or more tubes, eight months or longer.

The average year-round use of a set is two hours a day. If you listen longer, your "B" batteries will have a somewhat shorter life. If you listen less, they will last longer.

Our new booklet, "Choosing and Using the Right Radio Batteries," is free for the asking. It also tells about the proper battery equipment for the new power tubes.

Manufactured and guaranteed by
NATIONAL CARBON CO., INC.
New York San Francisco
Canadian National Carbon Co.,
Limited, Toronto, Ontario

Tuesday night means Eveready Hour—9 P. M., Eastern Standard Time, through the following stations:

WEAT—New York	WSAT—Cincinnati
WJAC—Providence	WEAR—Cleveland
WEEI—Boston	WWJ—Detroit
WTAG—Worcester	WGN—Chicago
WPT—Philadelphia	WOC—Davenport
WGR—Buffalo	WCCO—Minneapolis
WOAB—Pittsburgh	St. Paul
KSD—St. Louis	



LEFT—No. 486, for 4, 5 or more tubes. \$5.50.

RIGHT—Eveready Dry Cell Radio "A" Battery, 1 1/2 volts.



EVEREADY
Radio Batteries
—they last longer

1264



© S. W. Clatworthy

Artist's Drawing of Some of the Far-Traveling Butterflies and Dragon Flies Which Nightly Visit Ships Miles off the Shores of Tropical Islands, Attracted by the Glowing Lights—See Page 741

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 45

MAY, 1926

No. 5

Radio Pen Draws Pictures from the Air

Attachment, Plugged In in Place of Loud Speaker, Converts Radio Set into Receiver for Broadcast Pictures

AN attachment which turns the voice of the receiving set into the skilled hand of an artist is the latest development from the laboratory of C. Francis Jenkins, inventor of the radio movies and a process for transmitting photographs through the air.

The new device—the radio pen—does not require any special receiving equipment, but plugs into the loud-speaker jack of any receiver and its range is limited only by the power of the transmitting apparatus in the broadcasting station. The pen outfit is not much larger than a loud speaker, being contained in a box eighteen inches square and eight inches deep.

Cartoons, maps, pen sketches, writing, anything, in fact, that can be reproduced satisfactorily in pen and ink, may be transmitted. At the sending end, the radio-pen transmitter is another small box, which can be plugged in on any existing broadcasting set, without changing the apparatus, so that the broadcaster can alternate between voice or music and pictures.

The sketch or cartoon to be transmitted is placed on top of the box containing the transmitting apparatus, and beneath the metallic transmitting arm, which sweeps back and forth across it, making and breaking the current. The original sketch itself can be used, or an electrotype or zinc etching, such as is used in reproducing the illustrations in a newspaper or magazine.

The receiving pen is much like that at the transmitting end, except that it may be equipped with a self-inking pen at the end

of the six-inch arm, so as to reproduce the drawing in ink.

The system of motors and electrical connections is such that the two pens work in unison, like the arms of a pantograph, except that they may be separated by miles of space. When the arm at the sending end is depressed and swept across a line of the drawing, the radio signals, broadcast and picked up at the receiving end, cause a corresponding movement of the receiver pen.

The pen opens a new field not covered by the previous devices for transmitting pictures. It sends from a flat surface, and receives and draws on another flat surface, whereas the photograph transmitters, employing delicate and highly sensitive photoelectric cells, must necessarily employ either rolled films or a complicated system of expensive prisms to get the same result.

"We believe that this pen-and-ink machine has vast possibilities in the military field," declared Capt. R. W. McNeely, chief of the radio division of the bureau of engineering, U. S. navy, who watched the first demonstration, when a series of pictures were broadcast from the naval station at Anacostia, D. C., and picked up in the Jenkins laboratory. "We are co-operating," he continued, "with Mr. Jen-

kins to the fullest extent in developing these machines for war purposes. Just now we are blocked from taking over the invention outright because of lack of appropriations, which is regrettable, but we nevertheless intend to keep in close touch with the future



The Radio-Pen Transmitter, at Left, Sending from an Ordinary Engraving, and the Receiver, at the Right, Reproducing on Paper

1519 Connecticut Ave.
Washington, D.C. 705



C. Francis Jenkins, Inventor of the Radio Pen, Seated at His Receiving Set While the Apparatus Reproduces a Drawing Broadcast from a Distant Station, and, Inset, the Drawing, Showing the Pen-Made Lines

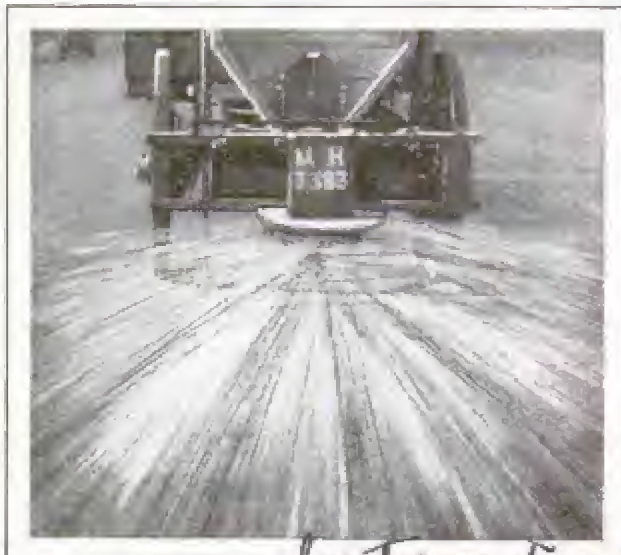


development work. The transmission of code messages, the sending of maps showing the location of enemy fortifications, machine-gun nests and transmission of written orders, with signatures in facsimile to prevent forgery, are only some of the uses that may be possible in war time."

For public use the radio pen may hold infinite possibilities. With it the bedtime story could be illustrated with appropriate drawings, and daily cartoons transmitted direct to the listeners.

ROADS SPRINKLED WITH SAND FOR INCREASED SAFETY

1066 *England*
After rains on one of the motor roads near London a sand sprinkler is pressed into service to give the pavement a safety coating to reduce accidents. The mate-



Sand-Sprayer in Operation on Pavement

rial is distributed from a revolving drum at the rear of the truck and is thrown on both sides to a total distance right and left equal to the width of the driveway.

BIG DREADNAUGHTS OF THE AIR TO CARRY TWENTY-FIVE GUNS

1420 *Chicago Evening Post*
Construction of two 6,000,000-cubic-foot rigid airships, each to be equipped with twenty-five machine guns for combating attacks from airplanes, is planned by the United States navy. Seven of the guns will be of the new 50-caliber type and eighteen of 30-caliber. The weapons are to be so placed that concentration of fire will be possible in any direction or angle, according to Rear Admiral William A. Moffett, and the big ships will rely upon the non-inflammability of helium gas rather than on armor for protection from hostile planes. Already, it is said, the introduction of helium has necessitated revision of aviation tactics, for a ship so inflated cannot be exploded or easily set on fire. Even if the bags should be riddled by bullet holes, it is estimated that hours

Chicago Evening Post
2/25/26

would be required to bring the craft to the ground through gas leakage. "The present contemplated, but untried tactics of airplanes against helium-inflated rigids call for the former to get above the airship and bomb her with light demolition bombs," Admiral Moffett explains. "A light plane, moving at the rate of 150 miles an hour is not conducive to accurate bombing. It takes twenty-eight seconds for a bomb to drop from 12,000 feet. An error of one-half of one degree from vertical of a bomb sight causes an error of over 100 feet in aim. During the period of the bomb's fall, if from 12,000 feet, a rigid moves one-half mile on her course. The airship can bring her one-pounder, four 50-caliber and five double-mount 30-caliber guns to bear on the attacking plane or planes. It is not conceivable that success is possible against such a volume of fire." An airship of 6,500,000-cubic-foot-capacity, plans for which already have been drawn, used as an aerial transport could carry 750 men with individual fighting equipment 500 miles at a speed of eighty-five miles an hour and retain fifty per cent of its fuel reserve, it is estimated.

WOMAN'S FOLDING FIRE ESCAPE LOWERS BY ELECTRICITY 1378

Devised by a woman seventy years old, an automatic fire escape is intended to be fastened to the roof of a building and lowered past the windows simply by pressing a button. When not in use, it lies folded up under a protective covering. Pressing the button, raises an arm which lifts part of the ladder, allowing the rungs to fall over the cornice. The rest unhinge and follow, dropping close to the sidewalk. Being shielded from the weather when not in use, the escape is less liable to wear out, and since it is out of sight, it removes one of the objections to the present types of equipment—that of disfiguring the exterior of an otherwise attractive building.



Women Inventor with Model of Fire Escape

*Delia Heath
Brooklyn, N.Y.*

ROPE-WALK AND AQUAPLANING MEASURE MENTALITY 1383

A keen intellect is useful even in walking a tight rope, according to tests with



© U. & U.

Playing Ball While Surf Riding, a Difficult and Thrilling Sport Requiring Skill at Balancing

students at Denver university. Fifty-six volunteered to walk across a tight wire, thirty-three feet long, while observers checked their performance. It was found that those of superior mentality had less difficulty, their muscles were better co-ordinated, enabling them to replace useless, false movements with skilled ones more quickly. Learning to balance is easier when fear is eliminated, the experiments showed. Students required fifty trials before they could walk across a rope stretched six feet above a mat on the gymnasium floor, but another group needed only thirty-eight trials when the rope was placed at three feet. It was also discovered that, when once the art of walking the rope was learned, it was not easily forgotten. Men came back after an absence of one or two years and walked the rope successfully at their first trial. Involving much of the skill required in keeping the balance on a wire, a ball game played on aquaplanes has proved a keen test for steady nerves. The planes are towed at the rate of thirty miles an hour behind a motorboat. Without using the customary hand ropes for support, the players toss a heavy cage ball back and forth while speeding over the waves, keeping their balance wholly by movements of their bodies.

Conducted by J. B. Johnson.

FIGHTING FIRES IN SKY REQUIRES NEW TOOLS

against the building, the fireman frequently is driven back by the intense heat when he comes in close contact with a window opening. As the motor ladders are supported by the truck base, they can be raised across the street, if necessary, and a powerful stream shot into the blaze while the fireman works in comparative comfort. The Equitable building fire was unusual in that it started in a shaft at one of the lower floors and sped upward, feeding mainly on electric-wire insulation, to break out into the building at widely separated floors. The worst damage occurred well above the thirtieth floor, more than 200 feet above the street. Firemen rode to the fire on the building elevators, and used the standpipes and fire equipment built into the building.

SEED AND PLANT TRAVEL AIDED BY AUTOMOBILE

Study of the travel habits of seeds and plants by Dr. H. A. Gleason, curator of the New York botanical garden, has revealed that nearly 700 alien species are growing near that city and similarly large numbers are to be found in the vicinity of almost every thickly populated center. Commerce has greatly aided the world flight of plants, hundreds of species traveling about in ships, freight cars and automobiles. A vessel takes on a load of earth as ballast and dumps it in a foreign port. If the climate is favorable, the seeds grow and plants distribute themselves by natural means. Shipments of hay, straw used for packing, or consignments of clover and other seeds contain foreign seed ready to take root in almost any environment to which they are delivered. The natural methods of distribution are varied and often effective. The witch hazel, for instance, develops two hard black seeds at the ends of the pods and, when these dry, they squeeze the seeds until they are shot forth like small bullets, sometimes as far as forty feet. Others are blown through the air with the aid of tiny hairs or "sails" and some are so small that they travel like dust. Among these are orchid seeds of which it takes 7,000,000 to weigh an ounce. Birds and other ani-



Huge Extension Ladder, Recently Added to the Equipment of the Berlin Fire Department, Being Tested Out before the Cathedral

Following a fire to the upper floors of a lofty building, or the tall steeple of a great cathedral has introduced new methods and new equipment for fire departments. Skyscraper fires, such as a recent blaze in the great Equitable building in New York, are a distinctly American danger, but Europe has its own problems in her famous cathedrals. The Berlin fire department recently acquired a motor-driven extension ladder, seventy-eight feet high, able to support the weight of a fireman at its tip while he directs a stream of water. These motor-driven ladders have simplified the task of fire fighting above the ground. With ordinary ladders placed

© Henry Miller

1398

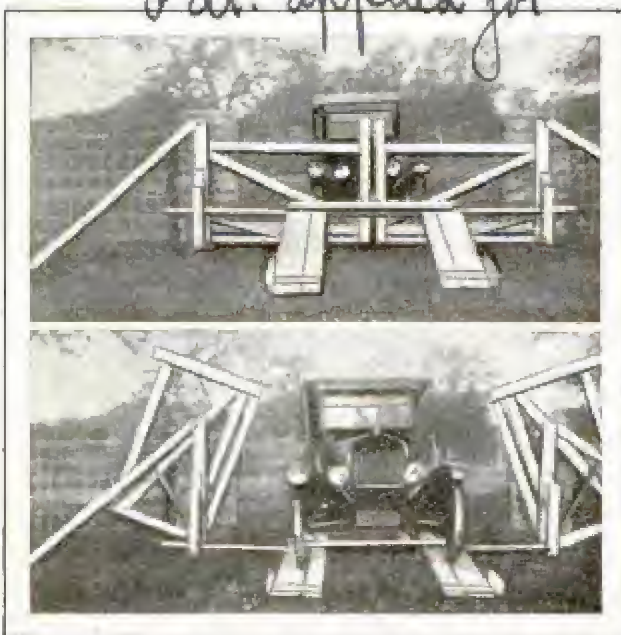
1403

new York
Perrow Park

mals help distribute plant life, while ocean currents bear seeds and fruits to great distances. One of the commonest travelers is the dandelion. It originated in Europe, but has now spread throughout the United States; the American prickly pear abounds in Australia; the Canada and Russian thistles are common in many parts of this country, and the wild cherry is widely distributed. Unwittingly, automobile tourists are doing much to help spread various kinds of plants from wilderness areas to towns and cities.

WEIGHT OF AUTO OPENS GATE

Equipped with springs and specially constructed platforms, a double road gate devised by a Texas inventor, opens and closes without the aid of an operator. The weight of the automobile, which is driven upon the platforms, depresses them, actuating the mechanism which raises the leaves of the gate, and when the car has passed through, coil springs automatically return them to position, leaving the platforms in place for opening the gate from either side.



Auto Approaching Gate and, Below, Leaves of Gate Tipping Back under Weight of Car



Japanese Boys Snaring Dragon Flies on Lime-Tipped Poles; When Captured, the Insects Are Tied and Flown from the Sticks

SNARING DRAGON FLIES ON POLE FAVORITE JAPANESE SPORT

One of the most popular amusements among Japanese boys is the sport of catching dragon flies on long poles smeared with lime. When the insects are captured, they are tied with fine string and flown from the sticks. The dragon fly is known to almost every part of the world except the polar regions, more than 2,200 species being classified. A peculiarity of some kinds is that they choose a favorite twig on which to roost and always return to it even after long excursions after food.

SEA WAVES ACT AS "WIRELESS" TO GUIDE WHALES

Washing of the sea waves is the "radio beacon" that warns whales, porpoises and many kinds of ocean fish to keep away from the shores and under the surface in stormy weather, according to Dr. Austin H. Clark of the national museum. As the waves break, their high-pitched, hissing sounds are easily located, Dr. Clark declares, and because the noise continues, it causes the sensitive sea creatures to keep away from it.

*Alfred Sundry
Box 17, Berne, Texas*



Serving as a Strong Bridge over Deep Ravine, These Logs Are Doomed to Be Cut Up for Lumber When the Standing Timber Is Depleted

RAILWAY BRIDGE BUILT OF LOGS IS HUNDRED FEET HIGH

1250. Spanning a deep ravine in an Oregon lumbering district, a bridge built of logs supports heavy trains passing to and from the sawmill, but is to be torn down and the pieces converted into lumber when available timber is cut from the area. The bridge is composed of 375 logs, from thirty to 110 feet long, and is 400 feet from bank to bank. Timbermen estimate that it represents about 500,000 feet of fir and 250,000 feet of hemlock.

WOOL DERIVED FROM WOOD

1402 Prepared from cellulose, or wood fiber, artificial wool now being manufactured largely as a by-product from the synthetic-silk industry, is said to have the soft, warm feel of the natural article besides a lustrous quality, which improves the appearance of cloth with which it is used as a mixture. Officials of the depart-

ment of commerce are of the opinion that the price of this substance will be between fifty cents and \$1 per pound as compared to \$2 a pound for natural wool, and one authority predicts that, in five years, the "wood wool" will be as common in our textiles as synthetic silk, which is now being produced at the rate of about 4,000,000 pounds a month in this country alone.

COCONUT SHELL AS "UKE" BACK REPLACES WOOD

1365 Hollowed and polished coconuts are being used in Hawaii as sounding boards for ukuleles. The shell is tough and vibrant and by cutting a wide opening on one side, a sufficiently large sound chamber is formed to amplify the tones from the strings. The modified instrument is called a "cocalele." The handle is made from koa wood.



Hollowed and Polished Coconut Shell Is Back for Ukulele

According to scientists, there is no insect that has a fatal bite.

literary digest 2/27/26.

Charles Johnson Co., d m
The Harragut.
 Washington, D.C.
 STEEL CYLINDERS FOR DAMS
 AID IRRIGATION 1401

Large steel cylinders that can be raised and lowered by electric power are being installed in an irrigation district in Mexico where the streams are subject to sudden rises. The first of these was erected on a large plantation near Torreon. It consists of two cylinders, each sixty feet long and eight feet in diameter. They are operated independently on heavy racks by power equipment placed on a masonry pier in the center of the stream. When in place, they form a water-tight reservoir, but can be quickly raised to reduce the store in times of flood. Another dam near by has cylinders ninety feet long and twelve feet in diameter and was built at a cost of \$250,000.

1294
**OUTDOOR ICE BATH IN JANUARY
 IN NATION'S HOTTEST TOWN**

Guests of a bachelor hotel in a California town below the sea level, where the temperature rises to extreme heights even in January, are refreshed with ice baths outdoors at a small charge. Tubs are conveniently located near the dormitory quarters, and the ice man delivers supplies directly to consumers. Government weather bureau records show that this town is the hottest spot in the United States during part of the winter season.



Bathing Hour in the Nation's "Hottest Town"; the Ice Man Delivers Cooling Chunks to Patrons Enjoying Outdoor Tubs



Showing How Furnace-Pipe Units Resist Strong Pull, and Close View of Joints

**LOCK-JOINTED FURNACE PIPE
 ELIMINATES SOLDERING**

Held together by special lock joints, a type of furnace pipe now on the market, requires no soldering and can be installed with greater speed, it is said. A smooth, rigid line results, and as the pipe is made with an inner and outer wall, greater heating efficiency is reported from it because of the dead-air space between the walls.

1399
FLOWERS AS CLOCK

Knowledge of the actions of various kinds of flowers and plants enables the observer to tell the time of day, as blossoms unfold at nearly the same time during the proper seasons. Their hours of "awakening" will vary in different parts of the country. In New Zealand, for instance, naturalists have discovered that most wild flowers open about six o'clock in the morning. Various kinds follow at more or less definite intervals. Chickweed, for instance, opens at noon, while the garden marigold goes to sleep at three o'clock in the afternoon. Water lilies retire at four o'clock.

Auckland News
 1/21/26

1198.

Cmt. James B. Ashford 3416
N. 31st St. Tacoma, Wash.



Close View of
Painting Rig and
Long Cable Strand

PAINTERS RISK LIVES ON CABLE TO PRESERVE POWER LINE

Cranking their way back and forth over the lengths of high-tension cables stretched across an arm of Puget sound, near Tacoma, Wash., painters on an improvised carriage had narrow escapes from death in coating the wire with a preservative to protect it against the elements. Always far above the water, sometimes 600 feet and never less than 245, they were exposed to the brisk winds from the ocean which caused their frail platform and the cable to sway. There were six lengths in all, and each was over 6,000 feet long. It took about four hours to make one crossing when everything worked smoothly. The paint was applied from a box compartment fitted with brushes which came in contact with the cable as it passed through.

Felt lining prevented the liquid from escaping at the ends. The carriage was moved by a system of cranks and gears. At one point it "bucked." In attempting to descend from a height of about 500 feet on a guy rope, one of the men fell and was severely injured. He was saved from death by becoming entangled in the ropes 300 feet down.

UNDERSLUNG TRACTOR HITCH TO PREVENT CAPSIZING

Like bronchos, tractors sometimes rear up when too great a haul is attempted with them. To prevent this, a Texas inventor has devised an underslung hitch attachment which is said to

center the pull midway between the four wheels and, by exerting at the same time a downward pull on the front of the tractor, helps to keep all four wheels on the ground and aids in steering. It is also said to increase the traction, and as the hitch is equipped with a spring, it acts also as a shock absorber.



Hitch Installed on Tractor and Detached

Leems Tractor Hitch Co.
of an Antenna Firm

The J. J. Herriot
Pray B. C.
Canada.

POPULAR MECHANICS

1375
Zanesville
Ohio

713

ONLY ONE-FOURTH OF CANADA SEEN BY WHITE MAN

Seventy-five per cent of Canada has not yet been seen by white men, according to R. H. Knight of Ottawa, president of the association of dominion land surveyors. He pointed out that travel is confined to the known routes and few persons ever visit the uninhabited regions that lie beyond. Only a small portion of the country has been mapped, Mr. Knight declared. From surveys made last year, it was discovered that the province of Ontario has about 1,500 square miles more territory than was previously estimated. During an exploratory trip in the northwest section of Canada, never before visited by white men, a series of lakes, 200 miles long, were discovered. It was also found that parts of the province of Quebec had sunk.

WOOD PAVING SET WITH RUBBER TO PREVENT SKIDDING

Surfaced like an automobile tire with projecting insets of firm rubber, a section of wood-block paving in England has been constructed to prevent vehicles from skidding. The special roadway lies paral-



Knobs on the Pavement Instead of on Tires as an Experiment against Skidding

lel to one smoothly paved so that comparative tests can be made.

■ A locomotive recently built in the east contains 203 tons of steel.



Playing a Musical Selection with Mixing Bowls for Radio Audience; Tones Resembled Chimes

MUSIC FROM MIXING BOWLS PROVIDES RADIO NOVELTY

Crockery mixing bowls of different sizes were used in playing musical selections from a radio station recently. Clear bell-like notes were produced but without the overtones that generally attend ordinary bells or chimes, it is said. Enough bowls were selected to give the notes of two complete scales and small hammers were used to strike them.

TREAT FOOD WITH ELECTRICITY TO IMPROVE HEALTH

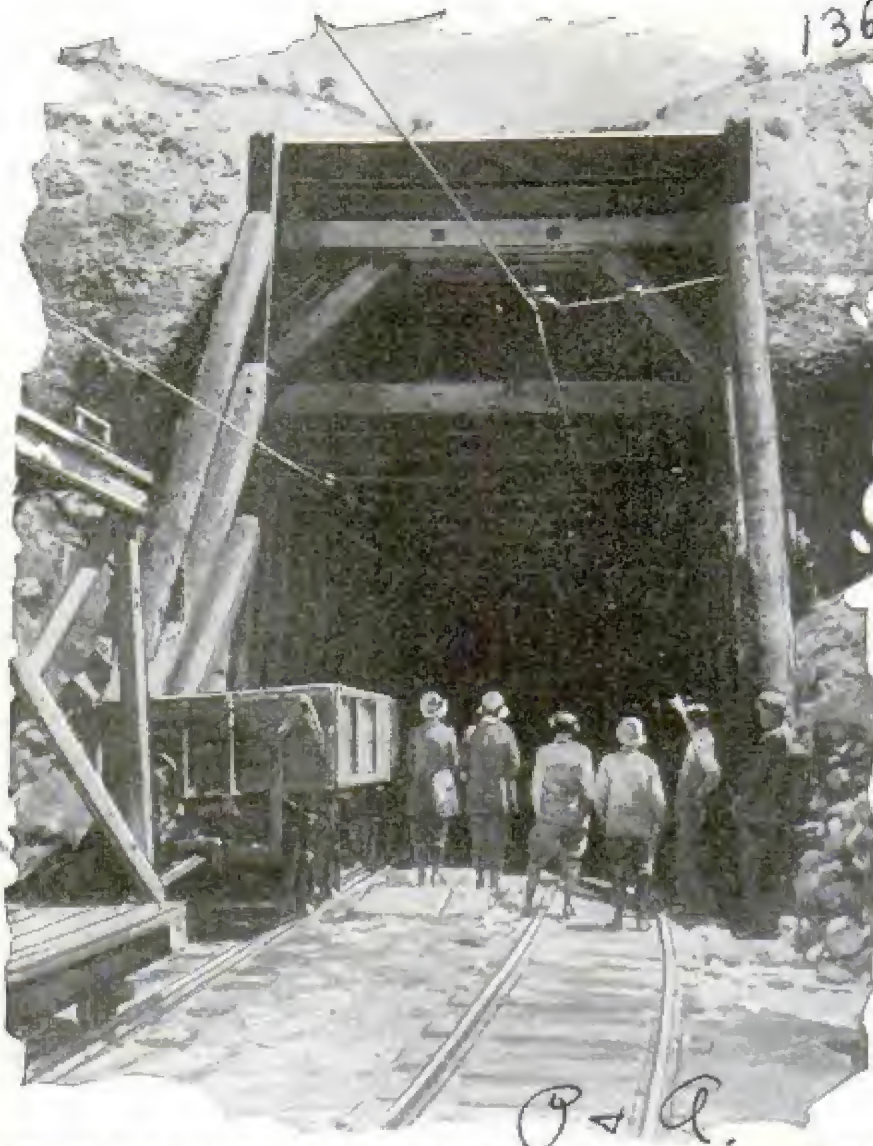
By exposing certain kinds of foodstuffs to ultraviolet rays, the Scottish board of health is reported to have discovered a way for restoring vitamins destroyed in cooking. It was found that some kinds of food that tended to cause rickets were made entirely safe by this treatment. Milk, exposed to the rays, became richer, it was said, while a substance known as cholesterol, inherent in many foods, was made beneficially active by this application of electricity. For some time, ordinary electric light has been used for ripening oranges and other fruits. It is said to produce a better color than sunlight. Ultraviolet-ray treatments with quartz lamps are reported to be efficient in many cases as substitutes for sunlight.

713
Landy Lane
Muscle

U-4 Utility Building
Central
new York
2/22/26

Us bridge Road
England.

*New York Herald
Tribune 2/17/26*



Where Trains Soon Will Be Thundering under the Rockies; Entrance to the Great Moffat Tunnel Which Pierces the Continental Divide

1296 LONG TUNNEL UNDER ROCKIES TO AVOID SNOW BLOCKADES

Opening of the six-mile Moffat tunnel under the continental divide in Colorado, scheduled for 1927, will permit more regular train service during the winter months especially, it is predicted, as delays due to snow blockades through that district will be avoided. Construction was started from the east and west sides, the eastern portal having an elevation of about 9,000 feet and the western 113 feet lower.

To secure ventilation, suction fans are to be installed in the tunnel, and to eliminate as much smoke as possible, locomotives will bank their fires before they are to pass through.

☛ The earth is likely to be struck by a comet only once in 20,000,000 years, scientists declare.

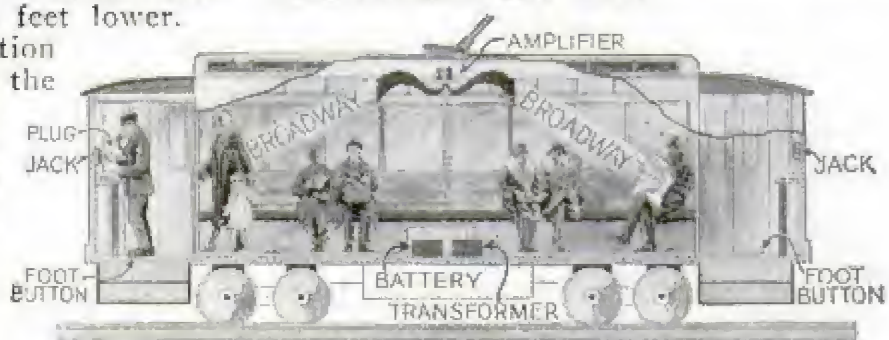
1369 PLANES FEED BIRDS DURING WINTER

Airmen went to the aid of the birds last winter in the snowy Alleghanies, dropping ear corn and other food from their planes. One aviator made half a dozen flights in one day, throwing out more than 150 pounds of feed, which was supplied by the Pennsylvania state game commission. An advantage of the scheme was that it reached the birds near their native haunts. While many species are to be found near the cities and in parks where they enjoy food supplied to them, others do not frequent settled districts and suffer severely when there is a scarcity of feed.

1308 AMPLIFIER PHONE ON TROLLEY CAR CALLS STREETS

For the convenience of passengers and to permit wider use of the so-called "one-man" street cars, an electric amplifying apparatus for the motor-

man's voice is intended to enable occupants of the car to hear street names with little difficulty. The system used is said to be one that causes no distortion of the voice. The motorman wears a breast-plate transmitter which is plugged into a jack at the end of the car. By pushing a foot switch, the amplifier is put in use and the sounds issue from a loud speaker that is mounted in the roof in the middle of the car and has two horns directed toward the back and front.

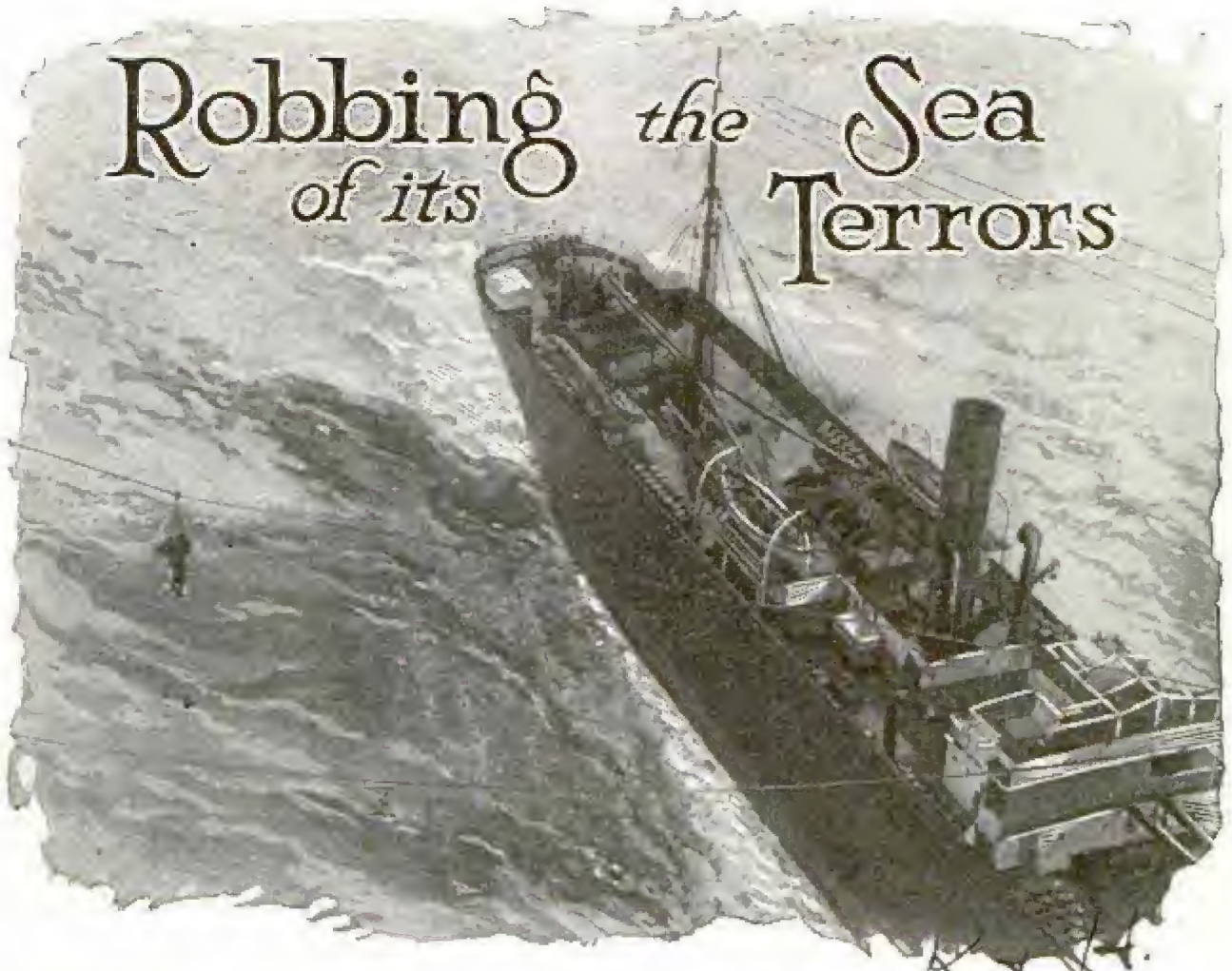


Sketch of Street-Announcer Apparatus as Installed for Use in Car; Motorman Speaks into Mouthpiece Strapped to His Chest

*Audiphone Co. of America
223 W. 42nd St. New York*

Blair County Game Warden and Hunting Association

Robbing the Sea of its Terrors



Driven Ashore in the December Gale, the Crew of the "Comtesse de Flandres" Was Rescued by English Coast Guards Who Fired a Rocket Line for the Breeches Buoy from the Cliffs on Land

INVENTIONS of the twentieth century, not in use until this decade, have saved from death this winter scores of men in the most bitter gales in the memory of the present generation of seamen on the Atlantic.

Early the morning of January 24, a radio operator brought to Capt. George Fried of the United States liner "President Roosevelt" an SOS from the British freighter "Antinoe." The "Antinoe" was helpless in mid-Atlantic and being smashed and pounded by mountainous seas. Fried's ship was nearest.

The position given in the message indicated the "Antinoe" was 100 miles away. After the captain had changed his course he sent word to the "Roosevelt's" radio operator to check the position of the "Antinoe" with the radio compass, a device not installed on American ships until three years ago.

The operator carefully manipulated his compass and then rushed word to the "Roosevelt's" bridge that the "Antinoe" had given its position many points of the compass from the actual position. It proved later that their skipper's figures had

been wrong by 100 miles. He had little chance to be accurate with snow and hail making astronomical observations impossible.

Only a few years ago the "Roosevelt" would have received the SOS but probably never would have found the "Antinoe." The men of the latter would have died as their ship plunged down while the "Roosevelt" was searching through hundreds of square miles of terrible seas.

The base of the radio compass is a large dial, marked with the points of the compass, and having an indicator placed over it which is attached to a loop aerial overhead. The aerial is on a pivot and can be turned in any direction by the operator.

When the radio operator of the "Roosevelt" was seeking the position of the "Antinoe" he turned the aerial until the dot-dash buzzing the aerial was receiving from the "Antinoe" was loudest. He noted the compass direction of the loop aerial and that was the bearing of the "Antinoe" from the "Roosevelt." His record was accurate. His success had depended entirely on his sense of hearing, which seems untrustworthy to the layman. But the use



Crew of United States Coast Guards, Above, Practicing Life-Saving Drill by Capsizing Their Boat in the Sea; the Picked Men of the Rescue Crews Must Be Familiar with the Behavior of a Boat in a Storm and Know How to Right It if It Upsets and Topples Them into the Sea; These Non-Sinkable Boats, Buoyed by Air Compartments in the Ends, Are Specially Designed with Hand Ropes Underneath So That They Offer a Hold for the Crew Even When Bottom Up and Can Be Righted Again



Lifeboat of the "President Roosevelt" Being Lowered in the First, and Fatal, Attempt to Rescue the "Antinoc's" Crew; Two of the Seamen in This Picture Were Drowned, and the Battered Boat Whirled Away in the Storm



A Successful Rescue, Showing the Twenty-Seven Sailors of the "Alkaid" Being Hoisted aboard the "Westphalia," Which Saved Them from the Sinking Dutch Freighter; the Gale Was So Bad That the Battered and Fast-Sinking Lifeboat Was Cut Away and Abandoned a Few Moments Afterward

of the compass this winter has proved its accuracy is almost mathematical. It is so certain in results that it may do away with lighthouses, radio beacons taking their place.

In Captain Fried's report to the United States lines he told of locating the "Antinoe" with the radio compass and continued:

"We arrived alongside her at noon with the wind west at sixty miles, accompanied by violent snow squalls and high rough seas, in which we were rolling thirty-five degrees.

"I took position a quarter mile to windward and poured oil overboard with excellent effect. Her captain claims this saved the 'Antinoe' from sinking.

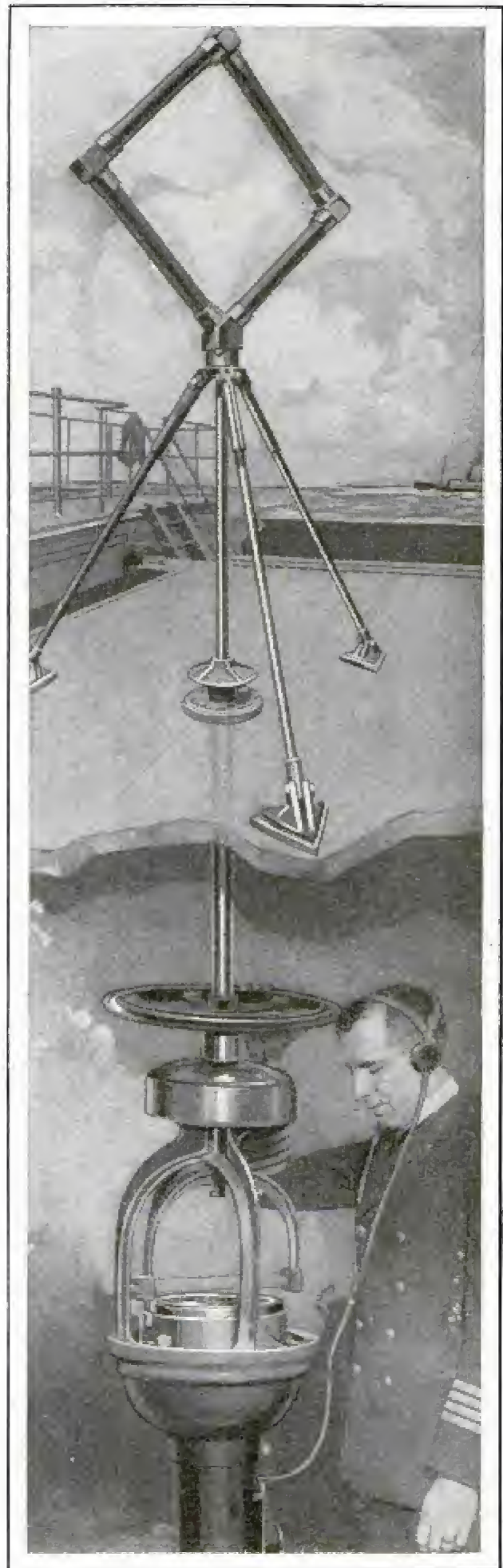
"I lost sight of her at 9:00 p.m. Her radio and dynamo were out of commission and there were severe snow squalls. Searched and picked up the 'Antinoe' again 3:40 p.m. on the twenty-fifth with engine and fireroom flooded, No. 3 hatch broken and boat listing heavily to starboard."

The officers of the "Roosevelt" did not believe the "Antinoe" could live through the night. Its starboard lifeboats had been swept away, the port lifeboats were stove in and useless, the steering gear was disabled, the navigating bridge wrecked by the fury of the seas, and the crew had only a flickering oil lamp for signaling.

Capt. Fried ordered away a lifeboat with chief officer Miller in charge. It was slung overside and lowered away. It was a Lundin boat, one of the strange-looking shallow tubs that have been adopted recently by several of the largest passenger liners. As it struck the water, its tackle was loosed and the men put their backs to sweeping the oars. They had taken a few desperate strokes, when a violent squall broke and the boat was whirled back to the "Roosevelt." As life lines were cast when it came alongside, a giant wave caught the boat and jerked it up perpendicularly to the water. Miller and his crew were pitched into the sea. High above them a dozen life lines were thrown, sea ladders were dropped and cargo nets were let go. All but two managed to reach the ship's side and were pulled to the deck.

"We made every effort," Capt. Fried reported, "to pick these men up, but were handicapped by darkness and continued snow and hail. Used powerful searchlights. Weather increasing.

"The twenty-sixth, continued on station distributing oil on weather side. 'Antinoe' showing one lamp. Her distress signals





indicated perilous situation. We attempted to float boat to her by aid of Lyle guns. The boat reached the 'Antinoe' but she lost it. Tried floating a cask and failed.

"Fired Lyle gun sixteen times. Line carried away near projectile frequently. At the suggestion of Colonel Hearn, artillery expert, who was a passenger, used spiral springs between projectile and line, which was successful."

The lines which reached the "Antinoe" were lost and this method of rescue finally was given up. The Lyle gun is a small smooth-bore gun which throws a projectile weighing eighteen pounds. The projectile has an eyebolt which extends beyond the muzzle and is attached to the line. After a day of working with the Lyle gun Providence brought help when the gale and sea moderated somewhat at nightfall, enabling the "Antinoe's" crew to be taken off after six lifeboats had been lost.

Without the Lundin boats it is extremely doubtful if the crew could have been saved. Chief officer Miller talked of them with enthusiasm when the "Roosevelt" reached Queenstown with the "Antinoe's" crew.

These boats are built of heavy steel but are unsinkable and self-bailing. Those carried by the "Roosevelt" are twenty-six feet long by eight and two-thirds feet wide

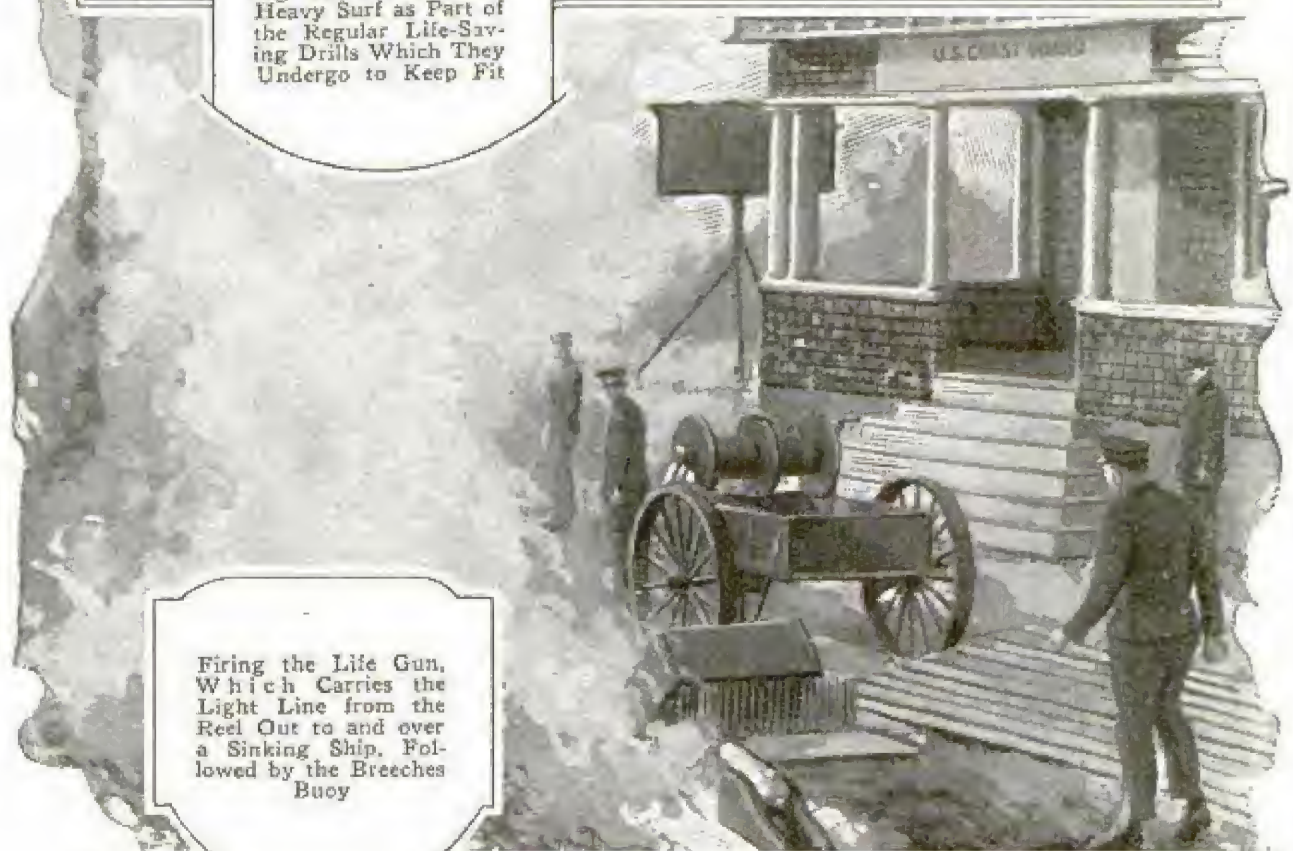
The "Westphalia's" Lifeboat Being Lowered to Rescue the "Alkaid's" Crew, and the Last View of the Latter Ship, Which Was Set on Fire to Prevent Its Becoming a Menace to Navigation



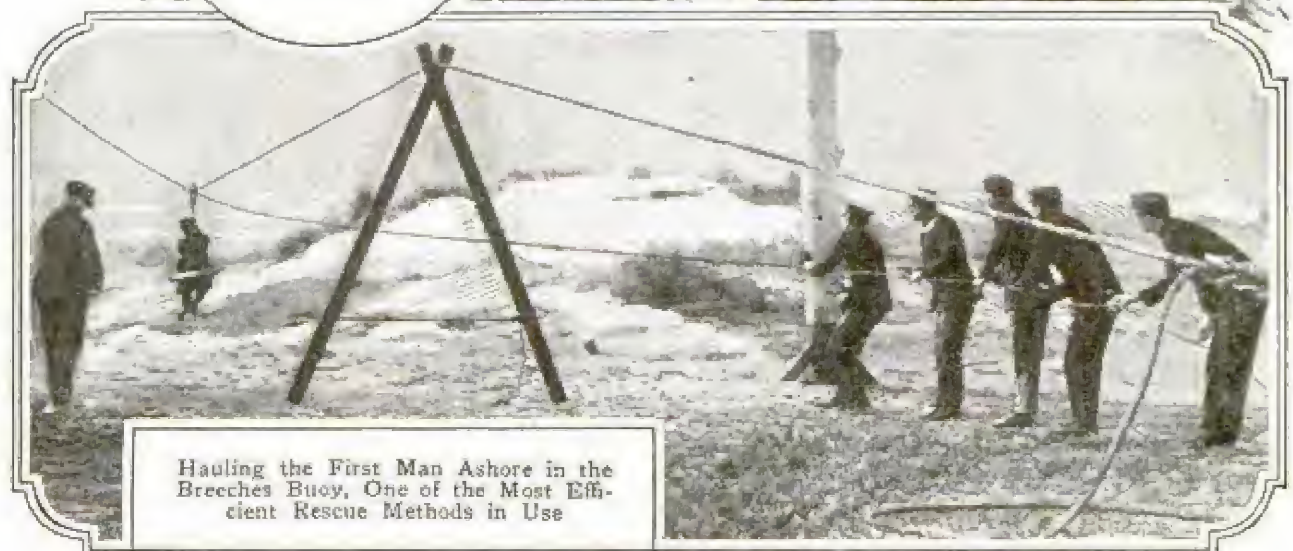
1265



Coast Guardsmen on Long Island Launching Their Boat in a Heavy Surf as Part of the Regular Life-Saving Drills Which They Undergo to Keep Fit



Firing the Life Gun, Which Carries the Light Line from the Reel Out to and over a Sinking Ship, Followed by the Breeches Buoy



Hauling the First Man Ashore in the Breeches Buoy, One of the Most Efficient Rescue Methods in Use

and carry fifty persons. They are shallow boats with nine water-tight compartments under the deck. Each compartment has a manhole so that it can be painted on the inside. Through them, from the steel deck to the underside of the hull, run pipes, open at each end, which carry out any water on the deck. The



The Life Car. Top, Successor to the Breeches Buoy, Will Carry Ten People through the Waves in Comfort; Below, Lifeboat Drill on the "President Roosevelt," Showing the Safety-Type Boats

buoyancy of the boats is entirely due to the air-tight compartments, and the boats cannot be sunk unless these compartments are smashed. They cost \$1,800 each.

Another valuable aid to the seaman in rescue work is the rocket, which has been in use for years. In principle it is like the small boy's rocket for the Fourth of July, but the simple device has aided rescuers to find ships in scores of instances.

All of the liners carry powerful searchlights, required to be always ready for use. The ships have bottle-shaped flares attached by lines to lifebelts on the rail, to be thrown overboard at night whenever a man is swept overboard. Before a flare is

thrown, a pin running through it is pulled out.

As sea water gushes through the opening, it touches calcium chloride, forming acetylene gas and calcium phosphate, which ignites when coming in contact with water. The fire from the calcium phosphate sets the acetylene gas burning and makes a light of 250 candlepower. The flares in ordinary use will burn for three quarters of an hour.

One of the crews saved by the radio compass was that of the Dutch freighter "Alkaid," sunk in the Atlantic. The men were brought into New York by the "Westphalia," February 7.

New York Herald.
2/7/26.

(Warre B.
Wells, London, Eng.)

HUGE DAM TO WATER DESERT FOR RAISING COTTON

Opening of the great Sennar dam, on the Blue Nile in the Sudan, is expected to make some 300,000 acres of previously barren land suitable for the production of cotton. A crop of 400,000,000 pounds a year is anticipated when irrigation and cultivation are fully developed over the area. The dam is considered one of the great engineering feats of the world. Erected at a cost of more than \$50,000,000, it is two miles long, required the excavation of 17,000,000 cubic yards of earth and the erection of 15,000,000 cubic yards of masonry. It holds back waters that ordinarily rushed to the sea and were largely wasted during the season of heavy rains. Four years were spent in building the dam and the work gave employment to thousands of natives who labored side by side with modern excavating implements. In mid-channel it is ninety feet thick and 130 feet deep. It has 206 sluices and spillways and the irrigation canal that is part of the project is sixty-six miles long.

Examining Pendulum in 100-Foot Shaft



Prof. John A. Eldridge

MEMORIAL TO WAR FLYERS ERECTED NEAR PARIS

In memory of the famous Lafayette escadrille, a stone arch with facades to be inscribed with the dead and living members of the unit, is under construction in a park at St. Cloud, near Paris. The French government has set aside sixty acres for the monument, which is being built as a result of an endowment, provided by a New York and Paris lawyer, at a cost of about \$125,000. The main arch will be over seventy feet high and will stand in an open glade in the midst of a forest.



Model of Memorial Built to Honor Members of the Lafayette Escadrille, One of the Famous Flying Units during the World War

HUNDRED-FOOT PENDULUM SHOWS EARTH ROTATES

Students at the university of Iowa have a graphic illustration of the rotation of the earth in a pendulum suspended from the top of a 100-foot shaft with its weight, a round ball weighing 100 pounds, adjusted over a graduated chart. Started swinging back and forth in a certain plane, the pendulum continues to oscillate in this plane, but due to the rotation of the earth, the plane apparently is turning in a clockwise direction, making one complete revolution each twenty-four hours like the earth, whereas it actually is the chart that turns with the earth. This instrument is an adaptation of the pendulum devised by Jean Foucault, and demonstrated in Paris in 1851. To assure accuracy in starting, it was drawn aside and tied by a silk thread which was then severed by burning it off.

William Nelson Cromwell

and Mr. Kurt Ruppert

722

POPULAR MECHANICS

Charles Lathrop Pachy Lakewood N.J.

Vienina, Austria
FLEXIBLE "GLASS" FOR AUTOS
TO INCREASE SAFETY

Service in many fields is anticipated from a synthetic glass, the result of sev-

dehyde and urea. At one stage in its preparation, it assumes a liquid form and can be poured like thick sirup. A ball made of the glass bounded to a height of more than twenty feet when hurled to a stone floor, and was not damaged.

DAMAGE TO TREES BY INSECTS
HUNDRED MILLION YEARLY

Damage done by the some 200,000 known kinds of insect pests that attack trees is estimated at approximately \$100,000,000 a year, according to a bulletin of the American Tree association. Some authorities say that the loss from this cause is greater than that from forest fires. In a single section in Oregon, enough trees to build 8,000 homes costing about \$10,000 each were killed by boring insects. Certain pests prey upon one another, thus protecting the trees, but the greatest natural allies of the forests are the birds, and in many parts of the country measures have been taken for their preservation.

SIX-WHEELED AUTO TRAILER
CARRIES HEAVY LOADS

For transporting steam shovels, road rollers and other heavy construction equipment, a six-wheeled auto trailer has a capacity of twenty-five tons, yet is so designed that the legal limit of weight upon any one tire is not exceeded. This is made possible by the installation of two short axles in the rear. They move independently of each other and can be completely revolved in a vertical plane. This distributes the load between the four rear wheels and provides the necessary bearing on road surface at all times, to comply with traffic regulations. The same construction is followed in the front axle. The entire load



Right, Pair of Rear Wheels Tipped Up to Show Independent Axle

is thus carried at three points, two in the rear and one in front, further relieving the trailer of undue strain.

At One Stage in the Manufacturing Process, the "Glass" Can Be Poured like Thick Sirup

eral years of experimenting by two Austrian scientists. The product is made of organic materials, is said to be hard, perfectly transparent and colorless and yet is so flexible that sheets and rods of it can be bent to a sharp curve or can be dropped upon the floor without damage. Even if it is broken, there is practically no likelihood of injuring the hands, for it does not splinter or leave jagged edges. This feature, especially, commends it for use in automobiles for windshields and windows, but it is expected to make serviceable insulating material, can be used in the textile trades, for transparent fuel tanks, dishes and glasses, and, possibly, for telescope lenses. Like quartz, it permits the ultraviolet rays to pass and thus opens up possibilities of greater adaptation of this treatment. It can be turned, drilled, cut, filed and polished, or etched with acids, and its specific gravity is only about one-half that of glass. The product is said to have been formed from formal-

Secured for England by Mr. Frederickburg
 British Bead Printers, Ltd., Northampton England

new York Herald Tribune 2/16/25
 San Francisco Calif.

Textile Application Reliance Trailer & Truck and similar glass in Canada 1644 Howard



The "Ship of the Desert" Going Aboard a Ship of the Sea at a North African Port on Its Way to a Foreign Zoo; Elephants Also Are Handled in These Derrick Slings

Giraffes, Rhinos, Elephants and the Blood-Sweating Behemoth, a Ton or So of Hippopotamus, Come High These Days

By JOHN T. BENSON

THERE are two questions that interest all who visit our animal farm at Nasau, N. H., where all the wild beasts imported from Hagenbeck's for the American circuses and zoos are acclimated and handled after arriving from Germany, where they have been trained.

The first is why we don't import more giraffes and rhinos, which, next to the elephant, are the favorites of the big African animal class.

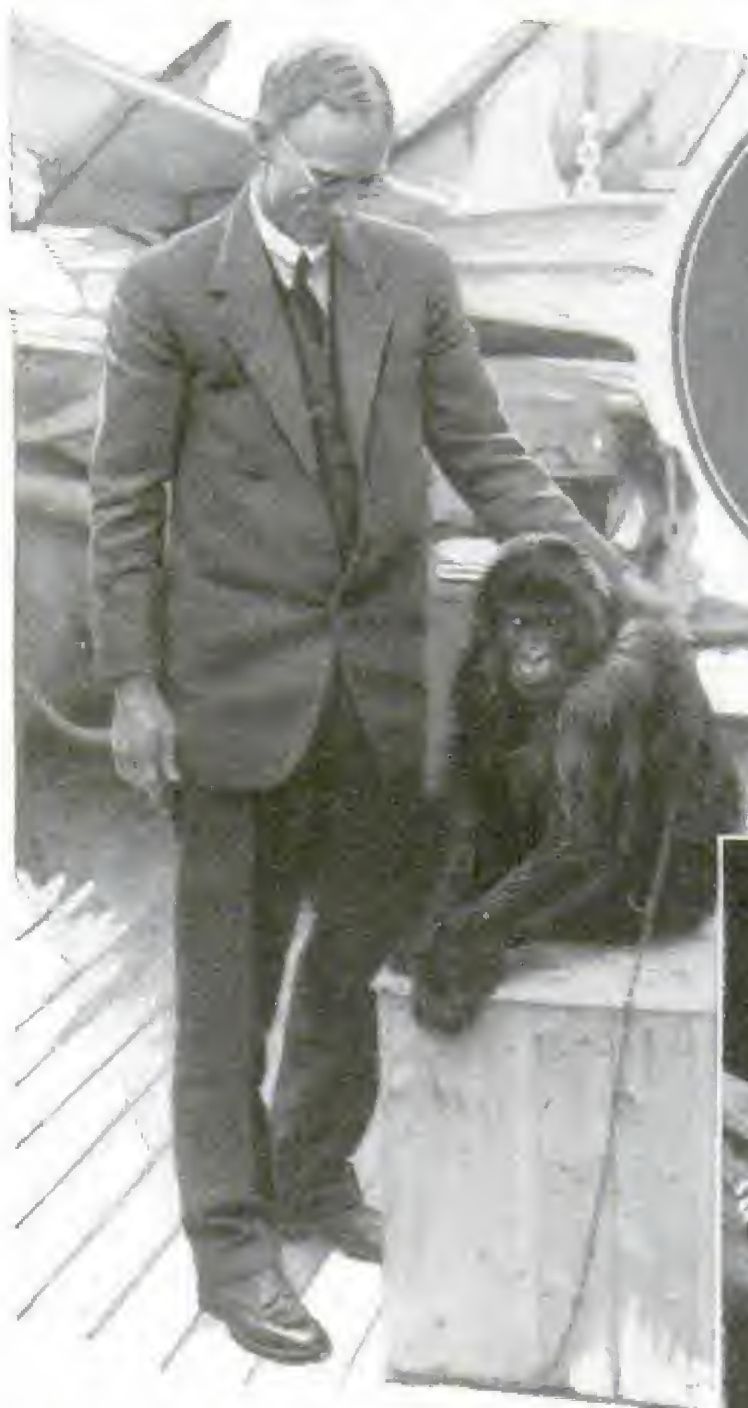
The second question is whether the high cost of living has affected the price of wild animals in the same proportion as it has other commodities.

Answering the second question first, it has; but after I tell you the story of how animals are caught, transported and trained, I think you will agree that they are worth all they cost.

As for the falling off in giraffe and rhino imports, the reason lies in the growing scarcity of the first and the savage dispo-

sition of the second. Not that the rhinoceroses seen in the circus or zoo over here are dangerous, for they were caught as babies, weighing only a half ton or so, and grew up in captivity, accustomed to being fed and cared for by men.

But when the animal collector in Africa goes out after a baby rhino and disturbs the peace and happiness of a two-adult-and-one-infant rhinoceros family, it is something else again. The adult in the wild has about the shortest temper of any animal known. It will charge anything or anybody on the slightest provocation. Take a ton and a half or two tons of rhino, armed in front with a single long bayonet horn, let it lower its head and start after you with the speed of a flivver on a good road, and it is time for the animal collector to keep cool and his nerves steady. It isn't pleasant to fancy that bayonet horn sticking through one, or that 3,000 or 4,000 pounds of mad rhino stand-



Left, Gorilla, One of the Only Two in Captivity, Arriving in New York; Above, the Chimpanzee, Most Humanlike of the Monkeys, in Its Winter Underwear; Below Is a Rare Ring-Tailed Lemur



ing over you tramping you into the earth. It is almost impossible to capture a baby rhino without a few men being hurt, and not infrequently some lose their lives.

Besides the difficulty of capturing a calf, the rhinos are all privately controlled by the rulers of each district, and it is necessary to get a special permit and pay a stiff fee for the privilege of trying to catch one—and if you don't catch it, you don't get your fee back. The armorplate rhino of India, for which the Roosevelt brothers recently have been hunting, is even harder to get—if the native maharajah can be persuaded to issue a permit.

Like the rhinos, the giraffes are protected by law and can only be hunted under permit. When the hunt starts, we



© John T. Benson

The Big-Game Hunter of Hagenbeck's in Africa, with a Party of Native Bearers Carrying in a Young Live Rhino, Trapped and Partially Tamed after Weeks of Hard Work

can't follow the movie-expedition method and round up a herd and chase them along before an auto until they are run out of wind. Any animal which has been run down and captured never lives long in captivity. Ask any race-horse man and he will tell you that when a horse has been ridden or driven beyond its limit it breaks either its wind or its heart. And so it is with all hoofed animals.

After our collector is on location and he and his horses and men have rested, it is easy to locate a band of giraffes, but to separate a yearling from its mother and the rest of the herd, and then capture it without exhausting or injuring it, is quite another matter. Then we have to get it back to the nearest of our African farms, which may be 200 miles or more away; get it contented and used to its surroundings; coax it to eat and drink, and finally pack it in a shipping box which must be upholstered like a parlor-car chair.

The nearest port to the farm is eighty miles away, and the big box must be

hauled over the roughest kind of road, and upon arrival at the dock, it stands for a day or two with curious crowds constantly peeping in and annoying the youngster, with switch engines puffing and whistling all around, and a very bedlam of noises from the other animals which have been gathered to make up the cargo of the modern ark. The young giraffe hears the roaring of lions and leopards, the howling of jackals, the snarling hyenas, and through all this noise, our giraffe has to stand in its box half frightened to death, while we endeavor to secure a good location on the ship where it will be quiet and comfortable and have plenty of fresh air until it is unloaded at Hamburg, to get its land legs and rest at the European farm. Then it must be repacked and make another long sea trip to America, a fourteen-day journey, be unloaded and acclimated again, and finally delivered safely to its new owners.

Elephants, the most wonderful of all animals, have gone up in price along with



When the Zoo Ostrich Gets a Sore Throat It Uses Up Several Rolls of Bandages, for, Like the Giraffe, the Ostrich Sore Throat Is No Mere Local Infection; Below, the African Game Hunter and His Wife Are Training a Couple of Lively Youngsters to Eat from a Pan



the others. I say the most wonderful, because I believe a good elephant is the most tractable of all wild animals. But the question arises, how you know a good elephant. Well, that requires years of experience, and it is partly for that experience that one pays when he buys an elephant. An expert can easily pick a good animal from a bad one, and let me tell you that a bad one is mighty poor property.

There are two reasons for the rise in prices of good elephants. One is that they are in very great demand and the other is that the supply is not so good as it formerly was. Our collectors have to go farther into the jungles and spend much more time rounding up a herd, and selecting and separating the best of them. Labor is higher everywhere, and all these things go to make the price greater.



There was a time, not so many years ago, when the elephant drive always yielded a good harvest, say a hundred or so young ones, from which a number of perfect specimens could be selected. But now we are fortunate if we get eight or nine good ones from a hunt. After they have been rounded up in the Indian jungles, the procedure is much the same as with giraffes.

Some are selected for training and are divided into groups of various numbers, depending upon the circus act for which they are to be used. Others are taught to carry a howdah and allow children to ride on their backs. Elephants are always caught in the dry season, when their natural food is the poorest, and they have to tramp for miles to get a good meal. As a result, they are always in poor condition and have to be fed up for weeks before they can stand the first sea voyage to Hamburg. There is no young animal, except the giraffe, which is more subject to ills than an elephant. They require a lot of nursing, but once they become accli-

mated they will, with proper care, live to a great age.

Only a few years ago a shipment of thirty young elephants left Calcutta for Hamburg, and only twenty of them arrived, because of storms at sea. They all have been paid for in the jungles, in August, and it is March or April of the next year before the first one is ready for sale, while those being trained may not go on the market for a year or two; so you can see that dealing in animals is an expensive and precarious business.

There is another big animal which always draws a crowd to its tank in circus or zoo, and that is the hippopotamus. Since the days of Barnum, when the first hippo seen in this country was billed as the "blood-sweating behemoth of Holy Writ," they have been favorites. The hippo got its nickname from the fact that the pores of the skin open when they have been out of the water any length of time and the pink underskin shows through, while drops of water falling from it appear to come out of the hide and look blood-red against the pink background.

The capturing of one of these big brutes is one of the most interesting stories of jungle lore. The hippo spends its days immersed in a pond, sticking its snout up occasionally for air. When one of our ex-



© John T. Benson

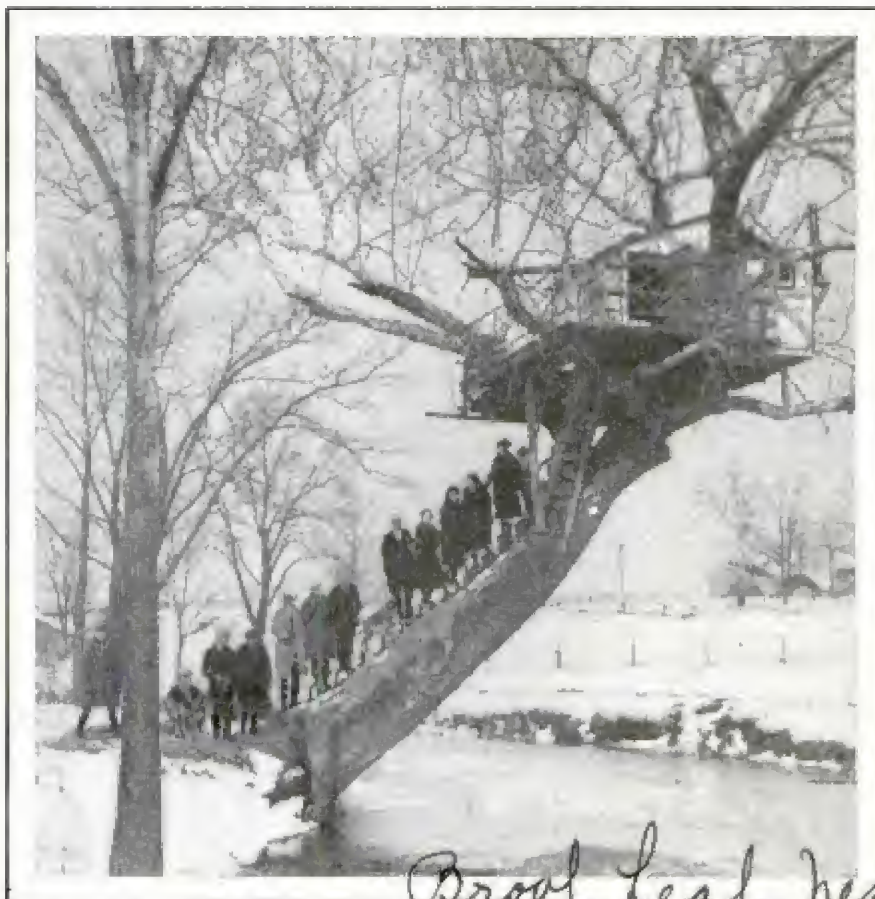
When a Young Giraffe, with Its Long Legs and Queer Gait, Takes It into Its Head to Run, the Man on the Other End of the Rope Has His Hands Full and His Feet Busy

peditions locates a pond, the collectors wait until the monster has gone in for a bath, and then dig a ten-foot-deep pit in the runway it uses, since the hippo always follows the same trail. The bottom of the pit is covered with branches to break its fall, and the top roofed over with light sticks, leaves and dirt, to restore its natural appearance. When all is ready, the natives are sent around the pond to beat on tin pans and frighten the animal out of the water. It dashes madly up the runway and falls into the pit. Then a cage without a bottom—just four sides and a top—built of hardwoods and tough vines, is brought up and placed over the opening, and firmly lashed down to the near-by trees. As soon as the cage is secure, the men start shoveling the dirt back into the hole and the angry hippo tramps it down until it lifts itself right up into the cage.

The capture has only just begun when the animal is in the cage, for it must be left there to become more or less reconciled to conditions. This may take days or even weeks, and all the time the captive must be fed and watered and kept sprinkled with water. Finally, a bottom for the cage is made of saplings and slid under it, securely fastened, and the animal is ready to start its journey to the farm.

The cage floor is covered with leaves and moss to keep the hippo from becoming footsore or bruised, and also to hold the moisture, for it must be kept constantly wet. Long poles are placed through the cage, and gangs of natives carry the burden out of the jungle on their shoulders.

No zoological collection is complete without at least one of another species of African wild animal—the zebra. These pretty creatures roam in herds of considerable size on the African uplands, and in order to select the young ones suitable for export, it is necessary to build an enormous corral, round up the whole herd and water it for days, and sometimes for weeks, until they are quieted down and the selection can proceed.



Tree Cottagers Have the Luxury of Abundant Cold Running Water Always at Hand and Radio for Entertainment

CABIN BUILT IN SLOPING TREE CONTAINS THREE ROOMS

Reached by steps upon a sloping tree trunk, a cabin built among the branches gives a group of young men in a Pennsylvania town a novel retreat for camping parties. The house contains three rooms and has the additional advantage of being protected from damp ground and insects that often mar the pleasure of living in such woodland cottages. A brook at the foot provides water for cooking purposes.

LOCK FOR SPARE AUTO TIRES SCREWS ON VALVE STEM 2-856

Spare tires are protected against theft by a lock that screws on the valve stem



and fits tightly against the rim. A key is needed only in removing it, and there is a spring-steel dust guard to keep dirt from getting into the mechanism. If desired, the lock can be used on running tires.

*The Batters Lock Co.,
Montgomery, Ala.*

PUPILS TAUGHT BY RADIO IN WEEKLY LECTURES



Pupils in English School Listening to Talk on the Caribbean Sea, Broadcast from Station in Birmingham; Weekly Lectures of This Sort by Radio Supplement Regular Classroom Work

Radio has become a practical addition to the teaching facilities of an English school system as the pupils are given a lecture once a week from a distant broadcasting station on some topic associated

with the work they have been studying. A loud speaker placed on the teacher's desk enables them all to hear distinctly, and they take notes while the lecture is in progress.

Price \$7.50.

AUTO BRAKE-BAND ADJUSTER SAVES TIME AND WEAR

Brake and transmission bands on small automobiles can be accurately adjusted from the seat with an attachment operated while the car is moving, thus giving better results. It can be installed in half an hour with screwdriver and wrench, and consists of a cover plate to replace that already on the automobile's transmission and three adjuster stems which are substituted for the ordinary adjustment nuts. These project upward to the level of the floorboard, which is perforated to receive them. The other ends of the stems pass through slots in the transmission plate. With a special key, the stems are turned from the seat, to take up slack in the bands or loosen them, as needed. Much



finer adjustments are possible with this device than with the nuts, it is claimed.

SUGAR AND RUBBER PRODUCED FROM SUNFLOWER AND BEAN

Oil of the soybean is the source of a rubber substitute scientists have prepared recently, and from a common kind of sunflower, known as the Jerusalem artichoke, chemists have extracted a sugar which is said to be fifty per cent cheaper than the cane or beet product, and sweeter, too. Two pounds of it will take the place of three pounds of ordinary sugars, it is reported. The plant from which it is derived grows wild in many waste places from Mexico to Labrador, and can be cultivated to give a yield of sixteen tons or more to the acre. Whether the rubber substitutes will be useful in the manufacture of automobile tires and parts has not yet been determined.

The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described and any other details in our possession will be promptly furnished.

Sleicher Corp. New York 17 W. 60 St.

Mfr. Century Eng. Corp. Newark, N.J.

Mr. Colman E. Sisson, Director Science Service Washington

DOUBLE PRINTING FOR MOVIES TO SIMPLIFY PRODUCTION

Elaborate motion-picture sets will be unnecessary, and studios will need to be only a fraction of their present size, in the opinion of a Danish director, as the result of an improved double-printing process. The details of the method are being kept secret, but it is said the process consists mainly in having the actors perform their parts in front of black-velvet drops and supplying the scenery later from small, accurately constructed sets or reproductions of other pictures. It is now said to be possible to show characters, who really are in the studio, as though they were traveling in a boat up a river in an Amazon jungle. The expense of taking companies on location for the sake of special backgrounds will be spared, it is predicted. Use of this system already has been made to some extent, but much greater possibilities are anticipated from recent improvements.

RING THAT CARRIES PERFUME SHOOTS SCENTED SPRAY

Concealed under a cameo setting in a novel ring now on the market is a tiny container filled with perfume. Pressure of the finger actuates a spring arrangement and a spray of the scent is sent forth. The design is said to have been inspired by the ancient poison ring in which dead-



Ring Open to Show Tiny Space for Carrying Perfume Concealed beneath the Setting

ly potions were secreted for use against enemies or for suicide.

■ In one year, a single oyster can produce as many as 1,000,000 new ones.

SEPARATOR FOR OIL AND WATER TO SAVE FISH AND BIRDS

For removing the film of oil often spread upon the water by ships in harbors



Studying Tank of Goldfish After Oil in Water Has Been Removed by Special Process

and rivers, an apparatus devised by an eastern inventor is expected to accomplish much toward protecting birds and fish from polluted waters. Sometimes a smothering coat of oil is driven inward from a considerable distance at sea, making it impossible for fish to obtain the necessary supply of oxygen and clotting the feathers of birds so that they are unable to fly.

TEN THOUSAND MILES OF ROADS PLANNED THIS YEAR FOR U. S.

During 1926, the federal bureau of public roads plans to spend approximately \$95,000,000 in adding some 10,000 miles of government-aid highways to the present system. Much of this money will be spent in and near the country's national parks and through the mountains of the west, where public playgrounds are being developed and opened. The task of cutting highways through forests and ranges is not always simple. Care must be taken in blasting not to cause destruction of scenic mountainsides; timber stands must be protected, if possible, by building trails around them, or if that is not feasible, through them, with the least practical loss, and great vigilance must be exerted to prevent fires while the roads are being constructed.

Chicago Daily News 1/20/26

982



Under the Glare of an Oil Flare, the Desert Pipe-Line Layers Slept While a Sentry, Armed with a Spear, Stood Watch to Warn of the Approach of Marauders

Steel Pipes Conquer Desert Wastes

Oil and Water Lines, Carried across the Sands on Camel Back, Introduce Modern Transportation to Persia and the Sudan

STRETCHING 150 miles across the burning waste of the Persian desert, a double line of steel pipes has just been completed after ten years' work to carry oil from Maidan-i-Naftun—the "Valley of Oil"—to the port of Abadan, on the Persian gulf. When the oil was turned into the pipes, one of the most traveled camel-caravan routes in the world was abandoned for this purpose.

For years all the oil from the interior valley has been brought to the coast on camel back, and ferried across the Tigris in native "gufas," small circular coracles built of wicker and plastered with pitch.

At almost the same time the Persian oil line was completed, another desert project

was finished at Port Sudan, on the Red sea, which has finally acquired a water-works by tapping the springs of the Khor Arbaat valley, in the Red sea hills. Until the present, the port's only fresh water came from distilled sea water, a limited and expensive supply. The operation cost so much that the occasional steamer that stopped there for water was forced to pay \$2.50 a ton, an almost prohibitive price. Finally an engineer conceived the idea of piping a supply from the springs in the hills twenty miles behind the town, at an altitude of 350 feet above sea level. Six-inch pipe was carried in on camel back, the line laid and the springs deepened. The water flows by gravity down to the



In Boats of Wicker Work, Daubed with Pitch, Supplies, Men and Animals Were Ferried over the Tigris during the Building; Below Is the Pipe-Laying Gang, Guarded by Arab Soldiers Mounted, on Matchless Desert Horses; Ten Years Were Required to Lay the Line to the "Valley of Oil"



seaside town and is pumped into storage tanks, reducing the cost to slightly over fifty cents a ton. Here and there along the pipe-line route, open tanks were erected where caravans might water their camels. The spilled water around the tanks irrigated the surrounding desert land, and within a short time small bushes and grass sprang up, creating a series of oases.

The Persian oil-pipe line was a much more difficult feat. The age-old caravan route leaves civilization as it crosses the first sandhill outside the port of Abadan and enters a waste of sand, wild gorges and rocky defiles that have not changed since Bagdad and Damascus were in their prime. Fierce nomads infest the occasional water holes, and it was necessary to keep an armed guard on hand to protect each camp of pipe layers. Because of the intense heat of the desert only natives accustomed to the climate could do

the manual labor under the broiling sun. Leaving the valley, the pipe line climbs mountain ranges and dips into deep gorges, necessitating several pumping stations along its 150 miles of length, and every piece of machinery, as well as all the building materials, had to be transported on camel and mule back. In the Valley of Oil a forest of derricks has been reared over the rich deposit, and a large boom town has sprung into existence, but the only connection with the coast continues to be the camel caravans and wicker boats on the Tigris, by which all supplies are brought in, and the homeward-bound workers taken out.

With plans under way for the development of the oil fields of Mosul, in the same region, the oil center of the old world is shifting to the regions around the Red sea and Persian gulf. Side by side with the ruins of towns that were at their best when the Old Testament was being



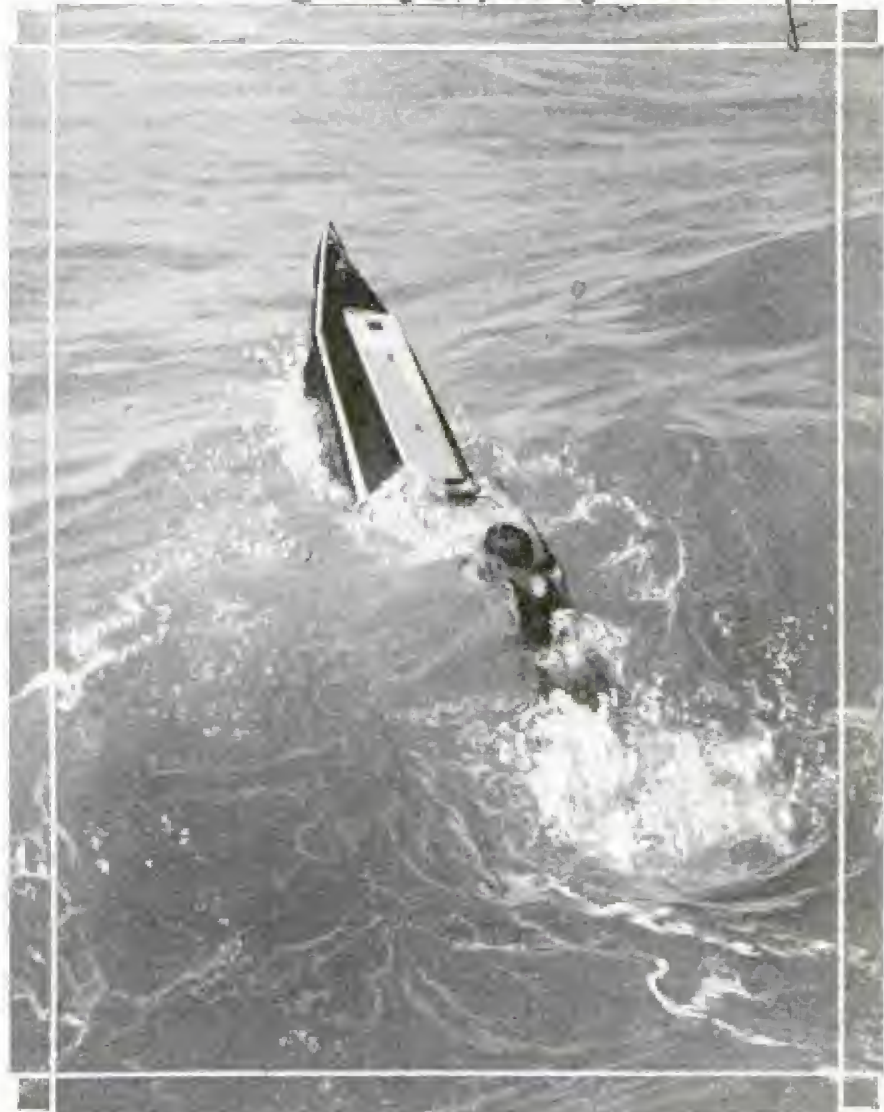
Mules and Camels Served to Transport the Steel Pipe and Pumping-Station Machinery across Mountain Passes and the Burning Desert Sands in This Land of No Railroads

117 Mr. Jules E. Haschke,

Redondo Calif.

lived, the steel of pipe lines, gaunt wooden derricks, and puffing engines of pumping stations are springing up.

The presence of oil beneath the desert sands is only another evidence that some of the most forlorn wastes on earth were once, long ago, garden spots where life flourished. Within the period of recorded history men have found little use for the bleached sand wastes, and they have lain almost unvisited by outsiders, save for an occasional archeologist, bent on exploration of the Biblical ruins, but now that oil is being produced in quantities, money and men to develop the country will be forthcoming in abundance. So far no refineries have been built near the wells. The output of the Persian field is pumped through the new pipe lines to Abadan, and on board of 10,000-ton oil tankers, for delivery to the refineries in South Wales. The fleets of huge tankers lie side by side in the harbor with Arab boats with their lateen sails and the gulfas of the Tigris, an incongruous intrusion in an ancient setting.



Motor-Driven Buoy Towing Life Guard to Rescue, Saving Him the Effort of Swimming through Heavy Waves

LIFE BUOY DRIVEN BY MOTOR AIDS IN RESCUES

For towing a live-saver to the scene of the rescue and aiding his return, an electrically driven buoy controlled by a push button at the rear, has been tested at high tide and in heavy surf with satisfactory results, according to reports. The equipment is in reality a small submersible motorboat, capable of considerable speed, and as it conserves the rescuer's energy, he is fresh to meet emergencies that may arise when reaching the person in distress.

FIBER FROM TROPICAL LEAF WOVEN INTO BLANKETS / 331

Said to resemble silk, a leaf fiber grown in Colombia, South America, is woven into blankets and clothing by the natives and also is used for fish lines. The leaves are from eight to fifteen feet long, and the fiber can be extracted by a simple process, according to reports.

SELF-CLOSING WATER FAUCET REDUCES WASTE AND WORK

Easier to hold than the ordinary fixture of its kind, a self-closing faucet need be opened only part way to assure a steady stream of water and automatically shuts off the flow when released. It is easily installed and its simple construction is intended to make it last a long time without the need of repairing.



J. Madison Jackson
Amory, Truel, Bldg

Mr. J. E. Simonson,
Columbia, Colombia.

1267

1259



Modeling Relief Map of California in Sand; Lakes, Mountains, Valleys, Railroad Lines and Other Features Are Plainly Indicated

MAKING RELIEF MAPS IN SAND AID STUDY OF GEOGRAPHY

Students in a San Jose, Calif., school make use of a sandpile in the study of geography by molding material into model maps of their native state and other areas. Important topographical features are easily represented, and since the sand is so

readily handled, "sketch" relief maps can be quickly formed to test the student's memory. Efforts are made to fashion the replicas in true proportions.

WHEN THE WAVES RUN WILD

Measurement of the pressure of the waves during heavy storms, as they crashed against lighthouses, have shown that the breakers sometime drive with a force of two tons and more to the square foot. At the Bell Rock and Skerryvore lighthouses, England, wave pressures of three tons a square foot have been recorded, and at Dunbar, a storm a few years ago piled water against the lighthouse in blows that registered three and three-fourths tons to the square foot. On one occasion during

a gale on the Bay of Biscay, a block of stone, weighing thirty-six tons, was lifted by the waves and hurled over a breakwater. At Wick Bay, where a breakwater could not be constructed, a concrete block, weighing 1,000 tons, was laid down and secured with iron bars. The waves dislodged the huge block, easily snapping the bars as though they had been strings.

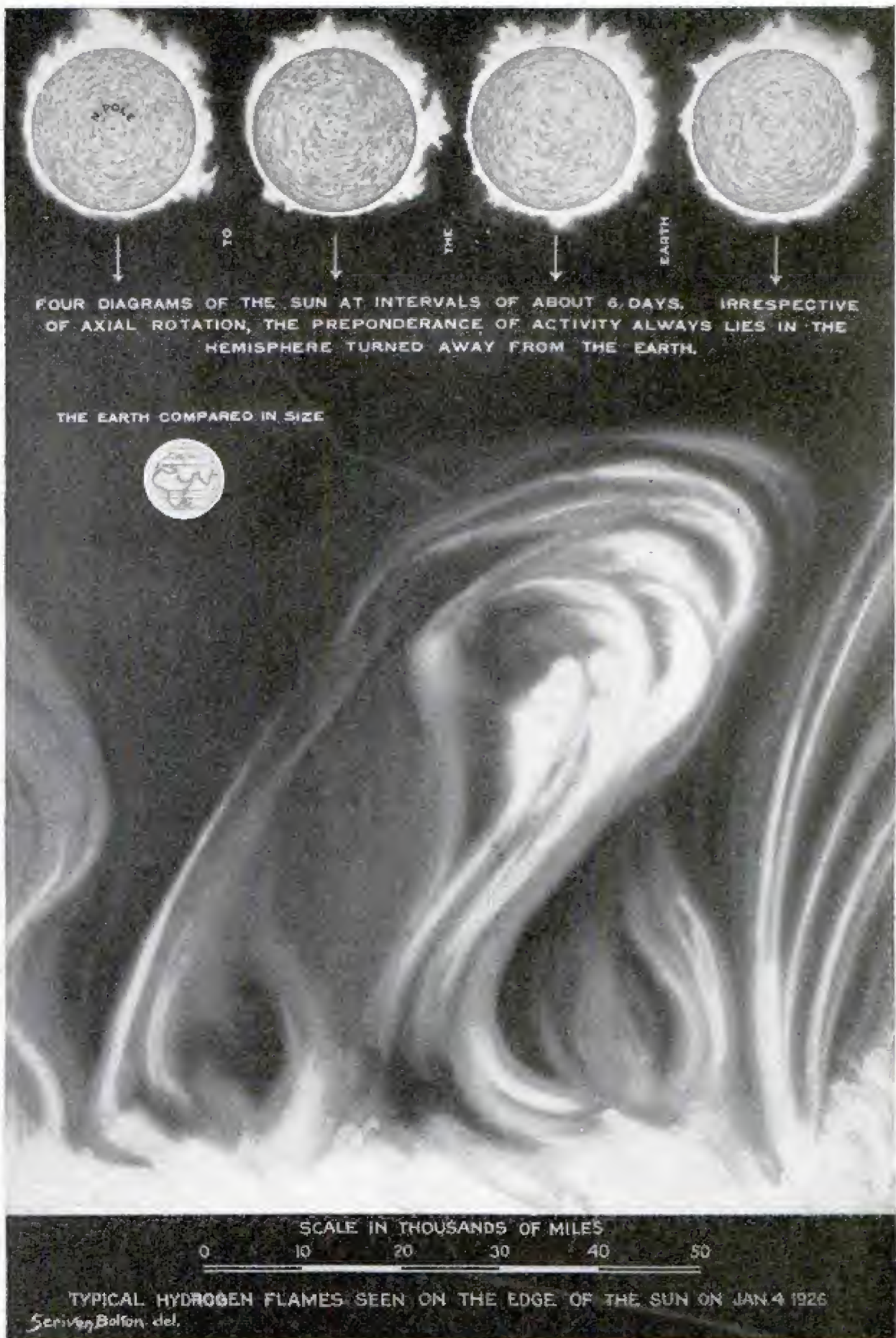
John O'Brien 1/30/26

IS SUN BEGINNING TO DIE, ASTRONOMERS WONDER

1236

In 1922, when the sun failed to deliver its annual contribution of heat to the world, astronomers prepared for a series of sunspot years. In that year the sun fell four per cent short of its average distribution of energy, but, more important still, it has not returned to normal in the three years that have elapsed since. The last few months have been marked by unusual weather disturbances due to sunspot activity, and the star gazers explain that the cause lies in the rare combination of a maximum of sunspots with abnormal tidal pulls, the two together affecting weather on the earth so seriously as to interfere with crop growing. Such a marked diminution in the heat cast out by the flaming gases of the sun is temporarily

serious, but does not necessarily mean that the sun has begun to die. The life of a star is estimated at some 30,000 billion years, so the sun undoubtedly has a very long life before it. Observation of the sun's corona of flaming gases during recent eclipses has convinced astronomers that the other side of the sun, the hemisphere turned away from the earth, is always hotter, with bigger streamers of fire, than the face we see. As the sun revolves, the pennants of flame move across its face, the bigger ones always keeping opposite the earth. As cyclonic storms sweep across the sun's surface, these flaming columns of burning hydrogen and other gases tower 150,000 miles or more out into space.



Courtesy Illustrated London News

416/26 0.93.
 Hydrogen Flames on the Sun's Surface, Sweeping Along in an Anti-Cyclone, and, Above, Drawings of the Sun at Different Stages, Showing How the Greatest Flames Are Always Away from the Earth



Persons Crossing Footpath between Lakes Appear to Be Wading Due to Elevation of Upper Pond over Lower One

DAM BETWEEN LAKES CAUSES ILLUSION OF WADING

Two lakes, one set about three feet lower than the other and with stepping stones between them, cause a curious illusion in an English park. To persons standing at the upper end of the higher lake, those walking below the dam that separates the two, seem to be wading in the water above their knees. In reality, they are on the dry stones, the width of the path being so slight that the two lakes give the impression of being a continuous body of water.

SAFETY ON AMERICAN RAILWAYS DOUBLED IN TEN YEARS

Travel on American railroads is twice as safe as it was ten years ago, according to figures gathered by the American museum of safety. In 1914, one passenger was killed for every 6,620,000 locomotive-miles traveled and one was injured for every 116,000 miles, but in 1924, the lines operated 11,250,000 locomotive-miles to each passenger killed and 287,000 miles before one was hurt. Similar records have been made in regard to railroad employees, the reports show. In 1917, a worker employed by the railways was killed in an industrial accident for every 9,120,000 man-hours of labor, while in 1924, one was killed for every 15,550,000 man-hours. For every 28,000 man-hours of work, in 1917, one employee was injured, but in 1924, only one was hurt for every 48,000 man-hours. These improving records are attributed, in part, to the influence of the Harriman safety awards.

X-RAYS TEST GLASS AND FIND BUTTONS

Aside from their use by the medical profession, X-rays have been adapted to service in various industrial activities. One of the most recent of these is in searching for buttons and other solid materials in piles of rags which are to be ground up for making paper. The rags are passed along endless bands moving over an X-ray tube. If buttons, hooks, eyes or other pieces that may damage the pulp machines are present, they can be seen distinctly on

a screen just above the band. The rays are also employed in a large English laboratory for testing glass of which thermometers are made. Unsuitable glass can be detected in an instant by the X-rays, according to reports.

SPARE TIRE ON LUGGAGE RACK SERVES AS BUMPER

Baggage rack and spare-tire carrier are combined in an arrangement that has appeared in England, and is said to be particularly adapted to small cars. The wheel is securely locked in place and easily re-



Placing Spare in Baggage Rack, and How It Acts as a Bumper When Carrier Is Down

moved, and when the rack is in the "down" position, the spare projects sufficiently to form an efficient bumper. When it is mounted in a vertical position, the wheel is inconspicuous.

¶ The Bible has been published in twenty-three dialects of English.

Made by Armstrong
Siddely Motors Co. Ltd.
W. 11 Aug.



Airplane View of Great Pyramids at Gizeh, Showing Modern Hotel with Shaded Yards and Gardens in Fore-ground; a Smoothly Paved Road Links the Past and Present

ANCIENT AND MODERN EGYPT SHOWN SIDE BY SIDE

While ancient Egypt gave much thought to the care of the dead, the nation today is by no means neglecting the living, as is seen in the modern hotel built specially for tourists at the foot of the great pyramids near Gizeh. Within a short distance of these venerable monuments, travelers can enjoy most of the conveniences that an up-to-date city hotel provides, while shaded grounds and gardens are furnished for their pleasure. A view from an airplane presents this contrast at a glance, the old Egypt typified by the solemn stone tombs of its kings and the new represented by the hotel near by.

shall turn to the right in going by. Approaching craft are said to be in dangerous proximity when 1,500 feet apart. In the rules for medical examinations of aviators, a test for "night blindness" is included, and a "good family history" with reference to nervous stability is another requirement.

TRAFFIC CODE FOR AIRPLANES TO SAFEGUARD SKY TRAVEL

Similar in some respects to automobile-traffic regulations, a standard aeronautic safety code, announced recently, gives balloons the right of way over both dirigibles and airplanes, while dirigibles have precedence over planes. When aircraft meet, they shall pass to the right as in street traffic, and when one overtakes another, it

SCREEN DOOR UP IN SECONDS WITH SPEEDY HINGE



Screen doors may be hung or removed in ten seconds with a spring hinge now being marketed. The pin connecting the parts attached to house and door is inserted by the tap of a hammer or removed by a slight upward thrust. Another feature is that the springs are covered and are not displaced when the holding pin is removed. The hinge can be used on either side of the door.

Master Products Co.
6390 Park Ave.
Cleveland, O.

and Mr. C. O. Rogers Secretary
American Engineering Standard Committee

By H. M. Crane Chairman
Aeronautic Safety Code

FIGUREHEADS FROM OLD SHIPS VALUED AS DECORATIONS

1298 Among the most highly prized of the relics saved from old ships of Nelson's day



Measuring Figurehead of First Duke of Wellington, a Typical Decoration Such as Adorned Old Ships

and from other vessels, are the carefully carved oak figureheads which adorned the prows. A London shipbreaker has collected a number of these specimens, and after they are repaired and redecorated, they are in great demand as antiques. A giant figurehead of the first Duke of Wellington, shown in the accompanying illustration, is typical of the carvings which were lavished on the ships of olden days.

SEEK FOR RUBBER SUBSTITUTE IN KIDNEY BEANS

303 Chemists are reported to have found a way to make synthetic rubber from the soybean and now an English expert claims that the ordinary garden variety of kidney bean may be used for a similar purpose. The beans are partly dried after gathering, broken up and then treated with various chemical solutions until they are reduced to a substance that has the appearance of rubber and can be vulcanized in the same way as the true product, it is said. To further cheapen the substitute experiments are being made to cross-fertilize the beans in order to make the plants more prolific as well as to produce larger seeds with a minimum of leaf and stem development.

REAR SEARCHLIGHT ON TRAIN ILLUMINATES SCENERY

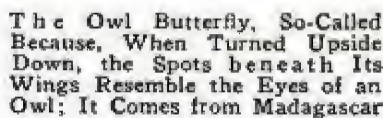
1289 Beauties of the scenery along the right of way of a western railroad are not lost when darkness falls, for a huge searchlight, installed on the rear of passenger trains, permits a clear view of woods, streams and even mountains at a considerable distance from the observation platform. The light is supplied with current direct from the railway system, which is electrified, and is focused to illuminate a wide area. It can be swung about with little difficulty. In emergencies, the light can be used with a red disk as a warning to trains behind.



Enjoying Scenery from Observation Platform after Darkness; Powerful Electric Searchlight, Supplied with Current from the Train System, Gives Passengers a Chance to See Wayside Beauties at Night

Chicago, Milwaukee & St. Paul Ry
Chicago, Ill

Conf. Secy. H. J. Golden, Reg. Ind. & Lab. Div. U.S. Dept. of Com. & Cons. Eng.



The flights frequently occur during dead calms, disposing of the belief that the butterflies might have been blown out to sea, as often happens with birds and various kinds of insects. Large butterflies and dragon flies are both listed among the ship visitors. The latter have been encountered 900 miles west of Australia, and 300 miles from the Cocos or Keeling isles, a barren waste on which they could not have existed. From their types it was considered probable that they had flown all the way from Sumatra.

The Largest Butterfly in the World,
Together with Specimens of the
Smallest for Comparison, and, in
the Center, Collector Photographing
Some of the Valuable Specimens

The Red Admiral, another famous traveling butterfly, is a world-wide cosmopolitan. Entomologists have encountered it in virtually every section of the globe.

Even such fragile flyers as the lace-winged flies and plume moths, about as substantially built as thistledown, regularly visit lighthouses twenty miles or more at sea. Many of them may drift along before favorable winds, but a surprising proportion of the journeys checked shows that either calms or unfavorable winds would eliminate this factor.

Japanese streams are to be stocked with brook trout from Canada if experiments now under way prove successful. A shipment of 50,000 eggs was sent from hatcheries at Vancouver at the request of the British ambassador at Tokyo.

British ambassador at Tokyo.
 Capt. Francis Leckie
 The Firs. Heriot Bay
 Canada

*Dr. Joseph McCann
New York.*

Violaphone

742

12/3

POPULAR MECHANICS

*Chas. S. O. Winters
District National Bank
Clay, Washington, D.C.*



Newspaper Rolled to Form Horn for Novel Stringed Instrument Played like a Cello

NEWSPAPER SERVES AS HORN ON STRINGED INSTRUMENT

Tones produced by a novel stringed instrument devised by an eastern musician are said to be amplified and improved simply by rolling a newspaper into the shape of a horn and inserting it in an opening near the base of the piece. The paper acts as a vibrating diaphragm, as in radio loud speakers of that material, and there are no metallic sounds as is sometimes the case when horns of metal are used. The instrument is essentially like a violin.

FIRE HOSE WRITHES LIKE SNAKE DURING STRENGTH TESTS

1255

Fire alarms sound, engines, trucks and ladders speed to the scene of the flames, long lines of hose are laid with almost incredible swiftness and streams of water are soon shooting at tremendous pressure upon the blaze. This happens many times every day, and failures in equipment, particularly hose, are rare in up-to-date departments. This is partly due to the rigid system of strength tests to which the government subjects fire hose to meet the requirements of the bureau of standards. One of the instruments used for the trials is a hydraulic pump. A length of hose is attached, and by progressive steps, the pressure is raised from ten to 400 pounds to the square inch. The high point is maintained for ten minutes, after which careful measurements are taken to determine what effect the treatment has had on the hose. The pressure may then be increased to more than 500 pounds, causing the length to squirm and coil like a snake. Minute inspections are made for leaks and sweating. There is on record at the bureau, where thousands of feet of hose are tested every year, only one instance of a length of hose bursting under a pressure of 550 pounds to the square inch. Such failures are exceptions to the rule, for most manufacturers have learned the secrets of making a strong, durable product. One of the regulations of the bureau is that the hose shall be flexible and easily coiled. For instance, a fifty-foot length,



Testing Fire Hose at Bureau of Standards; Pressure Is Accurately Measured and Lengths Closely Examined for Signs of Strain

two and one-half inches in diameter, must coil within a circle of a diameter not greater than twenty-eight inches. Proportionate limits are fixed for hose of different sizes and kinds. By chemi-

cal tests, the scientists determine whether or not sufficient rubber has been used in the lining, at least seventy-five per cent by volume being a requirement. The total sulphur content must not be more than eight per cent of the total weight of the rubber as compounded, and the material must be free from oil substitutes and reclaimed rubber. Tests are also made to determine the degree of adhesion between the backing and jacket; couplings are carefully examined as to their quality, threads and gaskets, and the bureau requires that each length averaging fifty feet must be provided with couplings made of an alloy of copper, tin, zinc and lead, each in properly prescribed proportions. In testing single-jacketed hose, one requirement is that it must not rise from the surface on which it rests to a greater distance than four inches under a water pressure of 400 pounds to the square inch.

RUBBER HEELS ON HORSESHOES PREVENT SLIPPING ^{13/8}

To lighten the horse's task on slippery streets, shoes that have thick rubber heels, with suction cups affording a firm grip on the pavement, are said to have proved practical and humane. They are so adjusted that most of the animal's weight is carried on the heel, reducing the wear on the toe calks, and there is less danger of causing wounds to the horse's foot, it is declared. There are only two calks to change on each shoe, instead of four or more on other types, and when the shoe wears down too low to give a sharp support on ice, it is still suitable for several weeks' service as a summer shoe, the manufacturers assert.



According to a British naturalist, the thrush can sing for sixteen hours at a time.

WORLD OF MOSS AND PLANTS SHOWS FLORIST'S SKILL ^{128/}

One of the features of the grounds at the national military home at Leaven-



World in Moss and Shrubs Must Be Kept Carefully Trimmed and Trained to Maintain Areas in Proportion

worth, Kans., is a model of the world in moss and live plants arranged over a framework of wooden slats and wire. One species of plant forms the hemispheres and another, of lighter shade, represents the oceans. The interior of the globe is filled with moss to afford a bed for the roots of the outside growths. Considerable skill was required to fashion the sphere accurately and substantially, and correct selection of plants was necessary to assure proper growth for keeping the right proportions of land and water areas.

ONLY FEW FARMS HAVE RADIO ¹³³³CENSUS SURVEY SHOWS

According to a recent survey of twenty states by the census bureau, out of the 1,853,869 farms in those districts, only 109,992, or less than six per cent, are equipped with radio sets. Of the twenty listed, Illinois made the highest showing, reporting a total of 27,434 sets, while Kansas was second with 13,189 sets. In September, 1925, the department of agriculture reported that little more than eight per cent of all the nation's 6,372,263 farms were equipped with radio receivers, and the more recent tabulation indicates that there is still a wide market for wireless apparatus among farmers.

Cent. Willfred L. Moore, 5118 Baltimore Ave.
Kansas City, Mo.

Dr. A. C. Carling, Toledo, O.
James E. Ray, Columbus, O.

The Road Grip Horse Shoe Co.
866 Park Ave
New York

GAS DRILLS FOR POLICEMEN AID IN BANDIT WAR

Members of the San Francisco police department are given weekly drills in the use of gas and protective masks



Policeman Wearing Mask of the Type San Francisco Department Has Adopted for War on Bandits

to help them in this mode of attack against criminals. Army officers from the Presidio near by give the instruction, the policemen being taught how to adjust their masks quickly and securely and how to use tear-gas and other kinds of bombs.

TASK OF MENDING OCEAN CABLE REQUIRES SKILL AND NERVE

When the transatlantic cable from Cape Cod to Brest, France, breaks, the repair

ship "Edouard Jeramec," a marine oddity among vessels with huge tanks that hold 250 miles of cable below decks, is dispatched to the scene and the work of mending the break which has been located by delicate instruments, is begun. Sometimes the strands have parted in mid-ocean. Down go grappling hooks weighted so that they can be sunk to a depth of three miles if necessary. Buoys are posted to mark the ends of the cable when it is found, and powerful winches fore and aft are ready to raise or reel out the heavy wire. Severe winds and raging seas must be disregarded and even night does not stop the work, for the scene is illuminated by powerful lamps. Often, before the cable has been pulled to the deck, it breaks again and slides back to the mud and slime of the ocean floor. Last June, just as the crew of the "Jeramec" was finishing the last splice on the broken cable, off Cape Hatteras, a terrific storm broke, throwing the ship on her beam ends. The wireless aerial was sent spinning to leeward where it became tangled in the propellers and the vessel's topmasts were torn off. But the damage was mended by the eighty-five sailors aboard, and the ship returned to complete the task of fixing the cable.

BOOK CARNIVAL HELD IN RUSSIA TO STIMULATE EDUCATION

In the interest of better school facilities for the citizens, a book carnival held in Moscow, Russia, featured a parade in which lines of marchers, carrying placards and banners, endeavored to spread their message for more education. The affair, staged at a time when the streets were crowded, attracted wide attention.



How the Russians Support Better Education, a Book Parade at Moscow during Literary Carnival

*George S. Johnston Co
835 W. Washington
95
Gold
make similar with*

*Chicago clearly news
2/17/26*

1846

1814

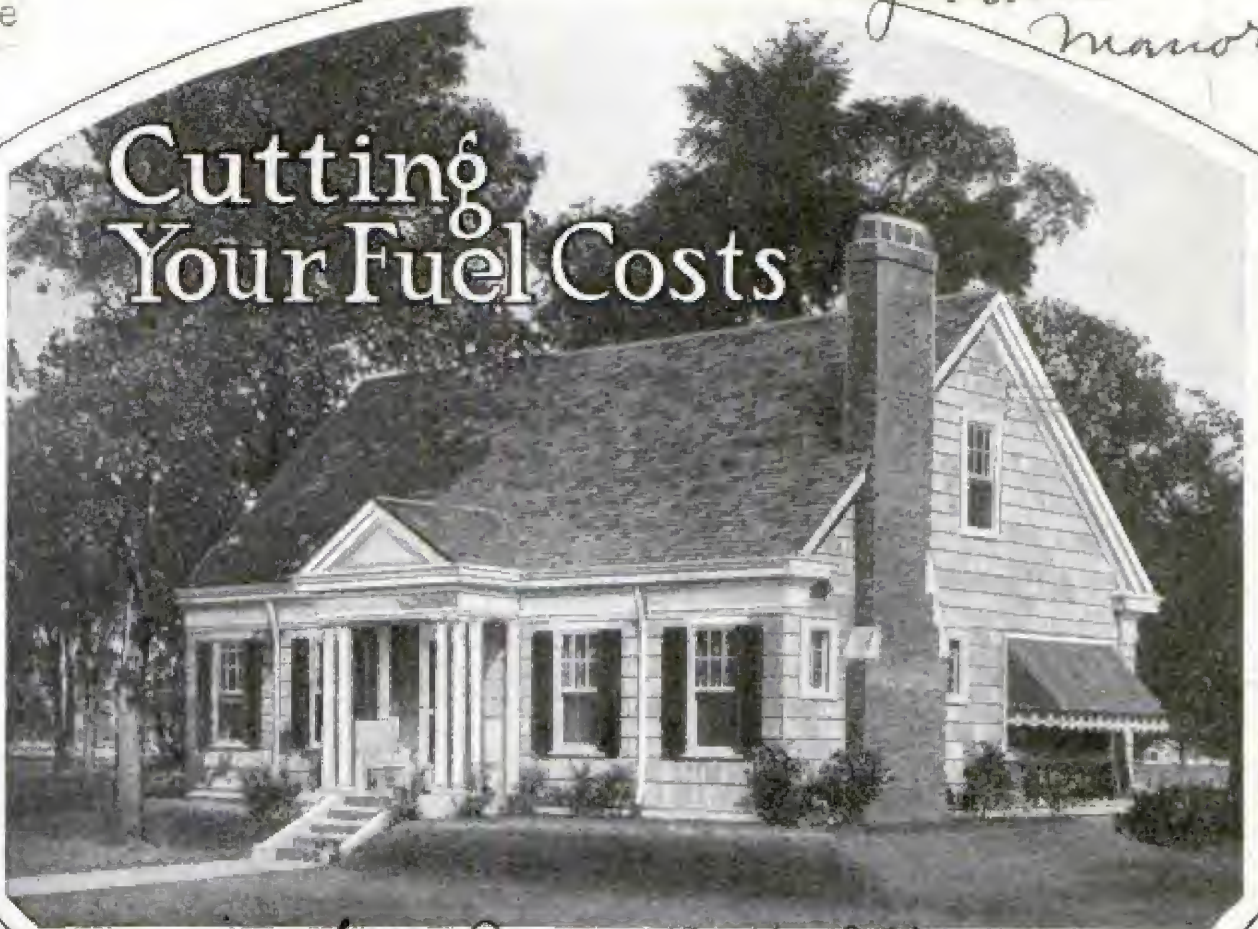
Understand

Bureau: 7
cubic fo
when one
bags.

6519 Algonquin Ave.
POPULAR MECHANICS Chicago. 745

Edgemoor Manor

Cutting Your Fuel Costs



See June 1924. 868

Completely Insulated House of Seven Rooms in Which Gypsum Product Was Used in Walls and Roof. While Many Novel Ideas Were Worked Out in Construction of Interior

New Methods Quickly Pay, While Fuel Bill for Uninsulated Home in Twenty-Five Years Equals Cost of House

AN insulated house will more than pay the cost of the insulation through fuel saved in the first three years, according to a recent report of the United States bureau of industrial research. Heat, the report explains, leaks through lumber, brick and stone just as it does through glass, though not so fast, but with proper insulation, fully thirty, and probably fifty per cent, of the nation's fuel bill can be saved.

A seven-room house, heated by a tiny gas boiler designed for warming garages or heating hot water for apartments, has attracted thousands to a new subdivision at the edge of one of Chicago's forest preserves, just outside the city limits, during the past winter. Here, where temperatures are commonly several degrees lower than in the crowded city districts, unusual heating records have been made. The insulation used, a new gypsum compound, is the outstanding feature, but the interior of the house presents a number of interesting departures from the usual build-

ing mode. The insulation, fire, sound and heat-proof, is poured into the walls and roof like cement, and completely fills the space between the studding and rafters, making a solid wall from the shingles on the outside to the wall paint inside. The two-by-fours used for the frame construction actually measure three and five-eighths inches, so the gypsum has a corresponding thickness.

Maintaining, by means of automatic thermostatic controls, a constant temperature of seventy degrees from 4:00 a.m. to 10:00 p.m. and sixty degrees during the night, and heating with gas at seventy-five cents a thousand cubic feet, the fuel cost from October 1 to February 1 totaled \$110, with an estimated cost for the entire winter of \$160. The insulation proved so successful that snow remained on the roof for days, until melted by the sun, while heat leaking through the roofs had removed it from all the neighboring homes.

The insulating material, called insulux, comes in bags, like cement and is mixed

See June 1924 868
insulux - Pacific Portland Cement Co.
on Pacific Coast 1200 Chas. C. Chapman, Bldg.

See June 1924 868
insulux - Pacific Portland Cement Co.
on Pacific Coast 1200 Chas. C. Chapman, Bldg.



Arched Openings with No Casing, Top; Right, Pouring the Insulating Material, and, Below, the Specially Built Doors and Hand-Wrought Hinges

with water. Owing to the presence of other chemicals with the gypsum, it expands in a few minutes after mixing to several times its original bulk. In this condition it is poured down inside the walls and allowed to set, hardening into a spongelike and porous mass, filled with millions of tiny air cells. The frame of the house was covered on the outside with plain matched sheathing, over which the shingles, dipped in pale-gray stain, were nailed. The inside walls, instead of being plastered, were covered with a gypsum wallboard, and after both sheathing and wallboarding were in place, the insulation was poured. The space between the roof rafters was treated in the same way, and in addition two inches of insulation was placed beneath the lower floor, in order that the floor might be warm while the basement, which extends under the entire house, would remain cool.

Gas engineers estimated that to heat an uninsulated house of the same size, twenty-nine by forty feet, with five rooms downstairs and two upstairs, would require a boiler with a rating of 1,150 feet,

and a direct radiation capacity of 575 feet. Figuring on the insulation, however, they guaranteed that a small garage or hot-water heater, with a rating of only 425 feet and a direct radiation capacity of 213 feet, would keep the house at a constant temperature of seventy degrees when the weather outside reached twenty below zero, about the lowest sub-zero temperature ever experienced in Chicago suburbs. Recording thermometers were placed upstairs and down, with bulbs outside the house, in the living room, in one of the second-floor bedrooms and in the attic space under the roof. A recording chart was hooked to the heater, to show when the gas was turned off and on by the thermostat regulator. A thermometer was added to give the temperature of the water in the heating pipes, and other thermometers installed in the dining room at the floor and ceiling levels and midway between. The record charts

made many interesting disclosures. In computing the heating required, the engineers based their calculations on a water temperature of 180 degrees in the pipes, since most hot-water heating plants work at from 180 to 200 degrees to maintain seventy-degree temperatures in the



Memphis

double plan Taylor

Original plan of E. 179th & St. Clair



View of the Living Room with Arch to the Tile-Floored Dining Room Beyond; Note the Rough-Painted Walls, Absence of Wooden Trim, and Sense of Space Because of the Broad Arch

rooms. Actually, the charts disclosed, it was only necessary to heat the water to 140 degrees on a day when the temperature outside was sixteen below zero, while with temperatures down to freezing, 110 degrees in the water pipes kept the house at seventy. In the twenty-four hours during which it was sixteen below zero outside, the recording chart on gas consumption showed that the gas was turned off for a total of seven and a half hours. On another winter day, when the outside thermometer chart showed temperatures fluctuating between thirty-five above zero and one degree above, the gas-consumption record showed no gas consumed for five hours during the day and six hours at night, or a total of eleven out of twenty-four hours when no fuel was needed to keep the temperature constant.

The thermometers at floor and ceiling in the dining room never recorded a greater variation than eight degrees, and the average was four degrees, as compared with differences of sixteen to eighteen degrees in uninsulated homes. Humidity records, taken at intervals, showed a very high percentage, never less than forty and frequently as high as forty-nine per cent,

indicating that the even distribution of heat and the fairly low temperature needed in the radiators did not dry the air out as in the ordinary steam or hot-water heated house.

The cost of the insulation was \$435, and approximately the same amount was saved at the start on the cost of the heating plant, since less than half the usual boiler and radiator capacity was required.

Some of the unusual methods of finishing the interior are as interesting as the results of insulation. Wallboard was used instead of plastering, a gypsum paint replaced wallpaper; interior trim was practically eliminated, and by using archways, most of the downstairs doors were dispensed with. Even the closet doors, with the exception of those in front of the linen and storage closets, were eliminated, and arched openings, with attractive curtains, took their place, giving a sense of greater space and connecting rooms.

The saving on doors and interior woodwork, including the expense of painting and varnishing, was estimated at some \$1,700. Instead of the usual baseboard, a very narrow molding was placed at the bottom of the walls. Window casing was

*Taylor Shing psychrometer
or humidity meter*

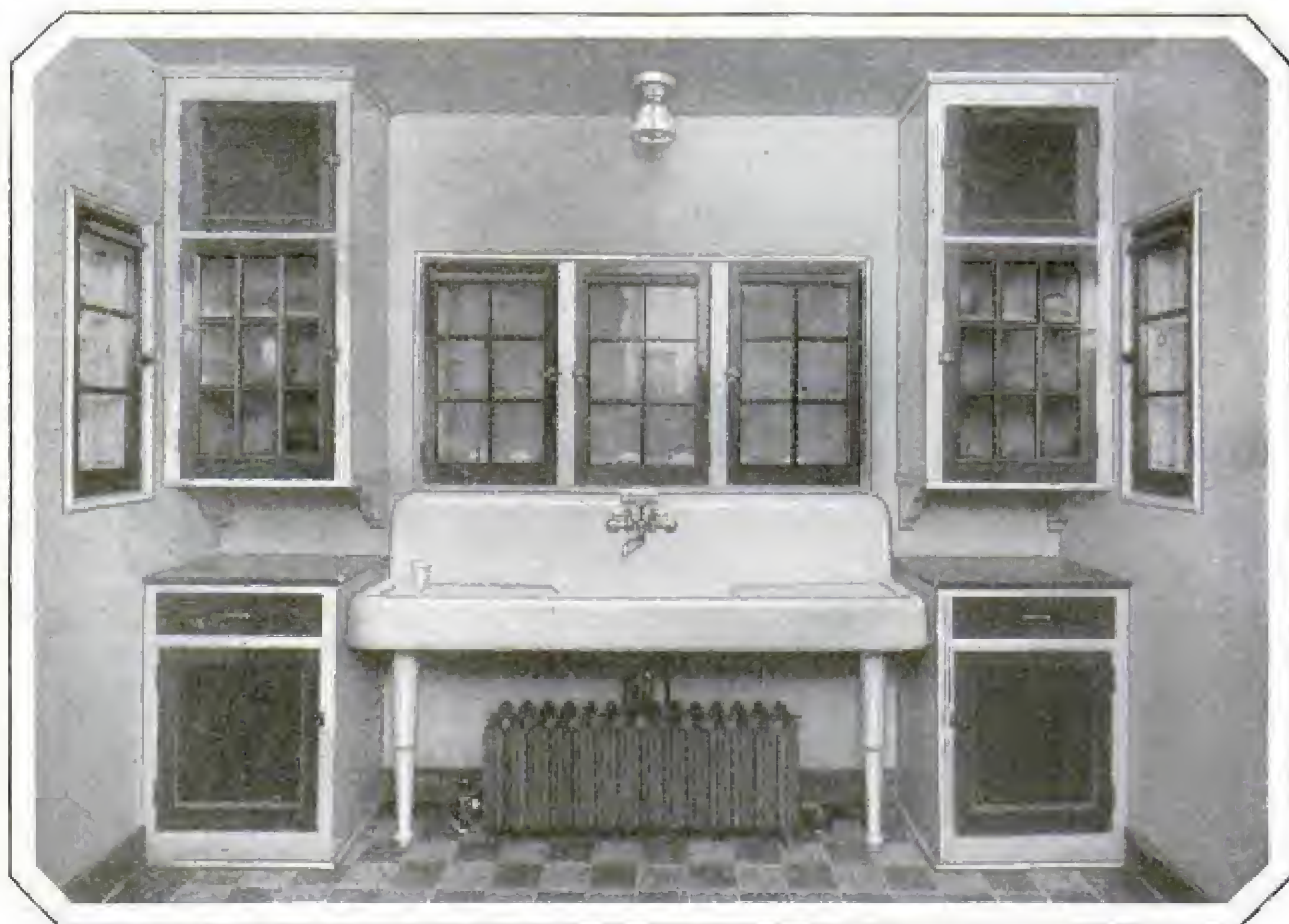
replaced by a half-inch half-round molding, such as is used on window screens to cover the edge of the wire, and the mold was then painted over with a special wall finish, kraftex, as was done with the picture mold just below the ceiling, giving both the appearance of being part of the wall, instead of being nailed on as an added accessory.

The arched openings were formed quite simply by cutting the wallboard to the shape of the arch, placing chicken netting across the top for reinforcing, a form below it, and pouring the insulating cement in from above. The usual cracks around the windows were avoided by cutting the wallboard to project over the window frame, and nailing it in place, while the insulating filling poured into the wall formed a solid bond with the frame.

The house cost \$13,000, at the relatively high prices for labor and material in Chicago. The cost also included a number of expensive time and labor savers not found in the average small home. A fireplace and outside chimney costing more than \$600 could have been built much more cheaply, or eliminated entirely. The built-in electric refrigerator cost \$385. Rubber tiles, a half inch thick, on the

kitchen floor cost \$9 a yard. The dining room was floored with tiles, but here the cost was no more than a good grade of oak flooring and a good carpet would have been. Fifteen hundred dollars was spent for bathroom fittings, including white tile almost to the ceiling line. An expensive type of hot-water heater was installed, and likewise a garbage incinerator. The gray shingles on the walls and the green shingles on the roof were selected wide stock, all hand-dipped. The lighting fixtures downstairs were specially designed and made by hand by a worker in wrought iron. The doors, such as were used, were designed from a model seen in a new movie theater, and built to order. Instead of having panels, they are built of solid oak planks, two inches thick and six inches wide, running lengthwise of the door, and at the joint there are beveled grooves approximately three-eighths of an inch wide and nearly as deep. The hinges were designed and made to order of ornamental hand-wrought iron, extending nearly halfway across the doors. The price of \$13,000 also included complete built-in kitchen-cabinet equipment.

It is because of its heating record, however, that the house attracted engineers



Photos Courtesy H. S. Ashenhurst

Part of the Built-In Kitchen Equipment, Which Includes Extensive Cabinets, Drawers and Other Receptacles; the Floor Is Made of Rubber Tiles, Half an Inch in Thickness



The Tile-Floored Dining Room Is Likewise a Livable Sun Parlor, Made So by the Small Space Taken by the Gate-Legged Dining Table, Which Seats Eight When Raised

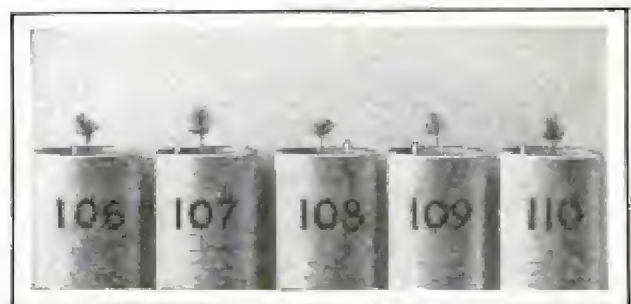
and architects from many cities, as well as thousands of home owners—more than 10,000 of the latter passed through it in three weeks. The gas engineers estimated that it would have cost \$350 to heat the house uninsulated, more than twice the expense this winter. The fuel saving made it possible to use gas, requiring no trouble, making no dirt, and leaving no ashes, at

a price less than coal would have cost in the same house without insulation. Because of the absence of fuel bins and dirt, the big basement, with its cement floor waxed, has been used for community dances and other functions, the small boiler, and the water heater and garbage incinerator occupying only a limited space in one corner.

TREES ARE WATERED BY TUBE TO MEASURE THIRST, 1359

Some 700 young trees are being used in a series of experiments at the Rocky Mountain forest station on Mount Manitou, Colo. to study their rate of growth; how much water they require, and other features. They are being grown in iron cans with the soil surface covered with paraffin to prevent evaporation of the water which is poured in through a small glass tube. By weighing, the amount of loss through the leaves of the tree is determined. The observers have found that probably less than one per cent of the water is taken up into the permanent structure of the trees, the rest being "breathed out" in the form of vapor. Five specimens, shown in the illustration, each consumed about a gill of water during a season's growth at the end of two years. The tests will cover a period of four years.

About forty plants of the different specimens will be saved for the final observations. The others are pulled up and photographed from time to time. A back-



Young Trees Growing in Iron Cans at Experiment Station; Water Tubes Are Seen above Rims

ground of plotting paper permits quick calculations as to the amount the trees have grown.

From two day coaches combined, the first palace sleeping car was built in 1858.

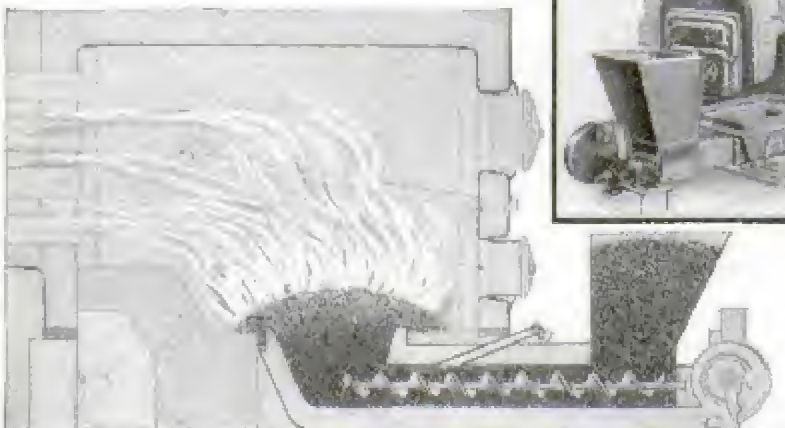
*Ent Allen P. Child
Box 4673, Kansas City, Mo.*



Kite, Seed Containers in Forester's Left Hand, and Reel Attached to Fender

SOWING TREE SEEDS FROM KITE SHOWS HOW NATURE PLANTS

226 Nature's own method of sowing was adopted by foresters in Washington recently when they scattered the winged seeds of the Douglas fir from a kite flown to a height of about 175 feet. Squares of white canvas were spread on the ground at intervals to leeward, up to about 1,600 feet distance from the kite. By counting the seeds that fell upon the canvas, it was estimated that approximately 80,000 seeds were distributed to the acre. The velocity of the wind was measured for the experiments by an instrument carried on the automobile, which was also provided with a reel for controlling the kite. A day when a moderate breeze was blowing was chosen for the test. The seeds were carried in small receptacles so arranged as to allow the contents to fall at a fairly even rate.



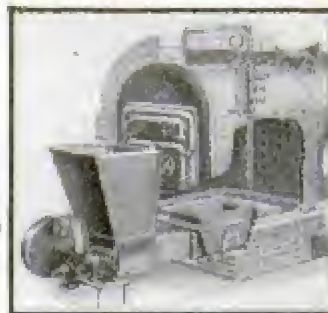
Cross Section Showing Worm-Screw Feed, Hopper and Interior of Firebox, and Inset of Typical Installation with Small Furnace

HUMAN VOICE-LIKE ORGAN PIPE WITH VIBRATING REED

126 One reason why great voices are rare is that few persons have the combination of physical characteristics necessary for the production of exceptional tones, according to a British doctor. The human instrument somewhat resembles an organ pipe. Instead of a vibrating reed, there are vocal cords, while the larynx and the bronchial system below it correspond to the pipes. The throat, mouth and nasal cavities form the resonators, and by alterations in their shape and size, certain parts of the fundamental tones produced in the larynx are emphasized. Slight differences in the structure of the various parts have a profound effect on the voice. Variations in the length of the vocal cords determine the pitch; the shorter they are, the higher are the tones. For this reason women's voices are higher than men's as their vocal cords have an average length of only about eleven and a half millimeters, while the average length in men is fifteen and a half. The range of the voice depends to a large extent upon the tension which can be exerted upon the cords. Except in celebrated singers, the range only in rare cases has exceeded two and one-half octaves, which, of course, lie in different parts of the musical scale for different voices.

STOKER FOR SMALL FURNACES SAVES COAL AND SMOKE

209 Adapted to heating plants no larger than those used in residences as well as larger units, an automatic coal stoker now on the market eliminates practically all smoke, reduces soot and saves fuel. It is operated by a small electric motor which



turns a feeder shaft, supplying coal from a hopper into a retort within the firebox. A fan supplies air, aiding in the combustion of gases and the thorough burning of the coal. The stoker is regulated so that it automatically stops, and starts again when more fuel is needed. It

may be installed at the front or at the side of the furnace and requires practically no attention save refilling the hopper. Parts exposed to the heat are cooled by the fan, and the coal feed can be adjusted to different rates.

Chas Fireman Corp. 617 Fulton St. Chicago

(Main Office) 1200 Broadway New York City



The Start of a Balloon Tire; These African Women Are the Backbone of the Rubber Industry in That Continent, for They Do the Actual Work of Tapping Trees and Gathering the Sap

Rubber Farm to Cut Cost of Tires

World's Need for Lower Prices Brings Life to Liberia, Founded by American Ex-Slaves More Than Hundred Years Ago

THE world-wide search for more and cheaper rubber for automobile tires has ended the century-long nap of Liberia, the hermit republic on the west coast of Africa, where English is spoken as the official language and where towns are named for American cities. Liberia was founded in 1822 by an American who took a few freed slaves back to the African coast, and has been recognized as a republic since 1848, but it remained for the demand for cheap rubber to give it a place in the business world.

An American tire maker, seeking some escape from the high prices fixed by the British rubber monopoly, found ideal rubber land in the hermit republic and has leased and started development on a million acres, capable of growing 100,000,000 trees and, within the next decade, supplying nearly one-third of the world's rubber. Fifty thousand acres will be planted during the first half of 1926, and a similar number during the last half. The rest of the million acres will be planted as fast as the land can be cleared, roads built and workers gathered.

The task is aggravated because of the backward condition of the country. Since the republic first was founded and its capital, Monrovia, named for President Mon-

roe, the country has been content to sleep. Part of the coast region, to a depth of fifty or sixty miles, has been partly cleared, particularly along navigable streams. There are, however, no roads, except for one of fifty miles out of Monrovia and another five miles long. There are no railways, telegraph, steamers on the rivers, nor any modern improvements. Before the rubber land can be planted, it will be necessary to build roads and railways, telegraph lines and telephone systems, and import tools and machinery.

The rubber development is expected eventually to produce much wealth, and therefore taxes, which in turn will provide money for the development of the rest of the country. One reason for Liberia's backward condition is the inability of the government to collect taxes from the natives, and this, in turn, is due to the lack of progress which has left the natives poor.

Liberia has always been closely related to American ways because most of the officials either were born in or are descended from negroes born in the United States. From time to time movements have been launched for the migration of large numbers of American negroes to the black republic, but each time they failed, largely because the prospect of living in

Herestone Tire - Rubber Co.
P. O. Box 1111



Top, Boiling a Small Lot of Sap beside the Tree; Planting the Seedlings, Center, and Below, Gathering the Sap



such an undeveloped country did not appeal. The new rubber industry, which will employ all native labor at

the start, is expected, in time, to make residence in Liberia more attractive.

The better class in Monrovia live in houses modeled after southern homes in America, read American books and papers, speak English, adopt American customs and currency, but only a few miles back from the coast such innovations are virtually unknown, except along the navigable rivers, and these, owing to a high plateau in the interior, are not navigable very far. The few backwoods settlements rejoice in such incongruous names as New York, Philadelphia, Bunker Hill and Hartford, but outside of them the influence of Monrovia is little felt, and, in fact, the vast part of the country has never been explored or mapped.

The explorers who have penetrated parts of the jungles have found more than twenty varieties of wild rubber trees and vines growing there, and, since 1904, rubber has formed a portion of the exports, a British company having started a planta-

tion which now has been acquired by the new American company as a nursery and experimental station.

The development of the million-acre lease is expected to take a number of years, but the first trees, planted this spring, will be ready to yield rubber within five or six years. Rubber trees are planted in open rows, like fruit trees, and, if desired, a plantation can be made to yield during its early years by growing other crops between the rows.

Not much relief can be expected from the new rubber plantations for several years, but the fact that American interests are getting into the field will probably help stabilize prices. During the past year the unusually high price has led to smuggling of raw rubber on a large scale in the Dutch East Indies, where op-

erations of the smugglers have been as extensive and picturesque as those of the rum runners off the American coast. Native boats plying between the islands were used to run the rubber cargoes past the customs.





Where Light from the Stars Is Bright Enough for Races; Ski Slides over Snowbanks at Swiss Resort Give Devotees of the Sport New Thrills at Night

MOUNTAIN SKI RACES AT NIGHT NOVEL WINTER SPORT /322

Night-time ski races furnish enthusiasts at Adelboden, Switzerland, amusement when the skies are clear. Light from the stars alone is said to be sufficient to guide the racers and they are spared the glare of the sun.

LENGTH OF GIRAFFE'S NECK FIXES ANIMAL'S VALUE /362

Giraffes are sold by the neck and hippopotami by the pound, annual stock taking of the animals at the London zoo has revealed. Giraffes generally are worth about \$2,500. The length of the neck is a determining factor because of the difficulties in shipping. The largest hippopotamus at the London zoo is valued at \$4,000, while the most valuable animal in the entire collection is an elephant which carries children on its back. Its worth is placed at \$5,000. Lions average about \$250 each, depending upon their size, age and disposition. Since tigers are more difficult to capture, they bring higher prices,

ranging from \$700 to \$900. The rhinoceroses are valued next to the prize elephant, being worth about \$4,500. All the animals at the zoo were estimated to be worth about \$125,000.

DOG TEAM CARVED FROM ICE AS WINTER STATUE /312

Occupying a prominent position in a Quebec park last winter, was a dog-team-and-driver statue carved from ice. The group was shown as though traveling and attracted wide attention because of its lifelike execution.

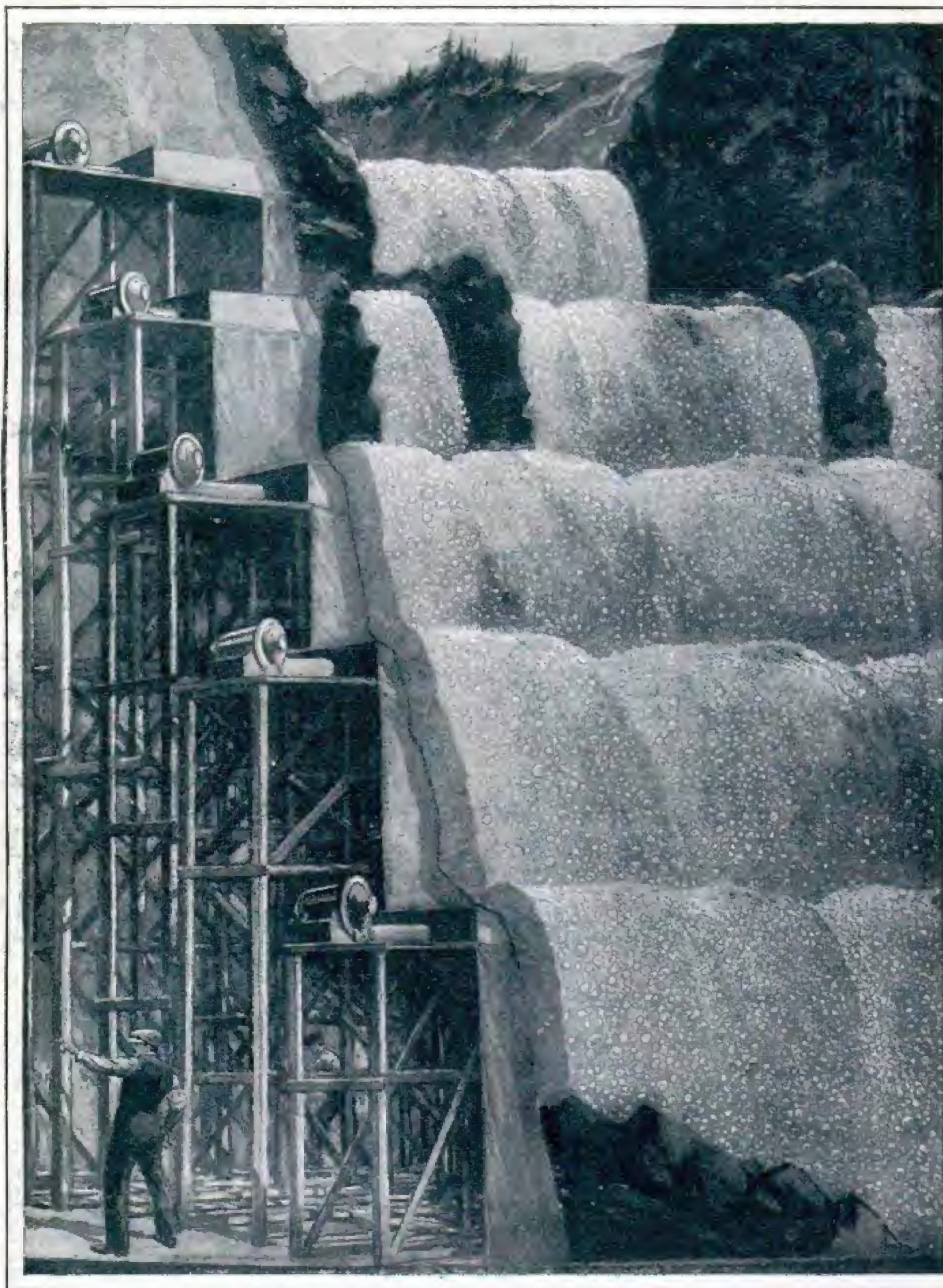


Dog Team, Driver and Sled Carved in Ice for Winter Display

Made by Michael Carlsmeier

*Chicago Daily News
2/19/26*

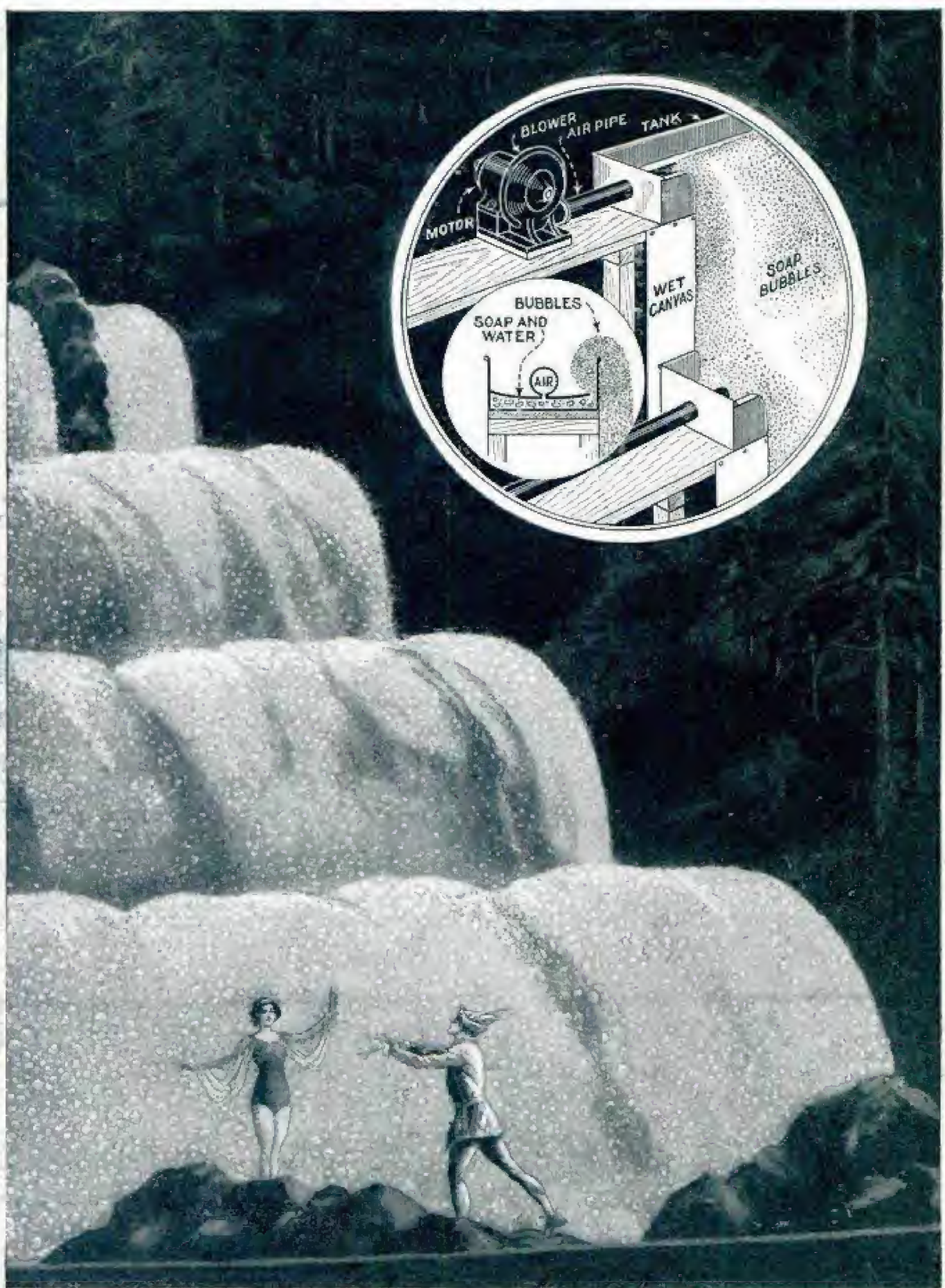
Blowing Three Million Bubbles a Second



Courtesy

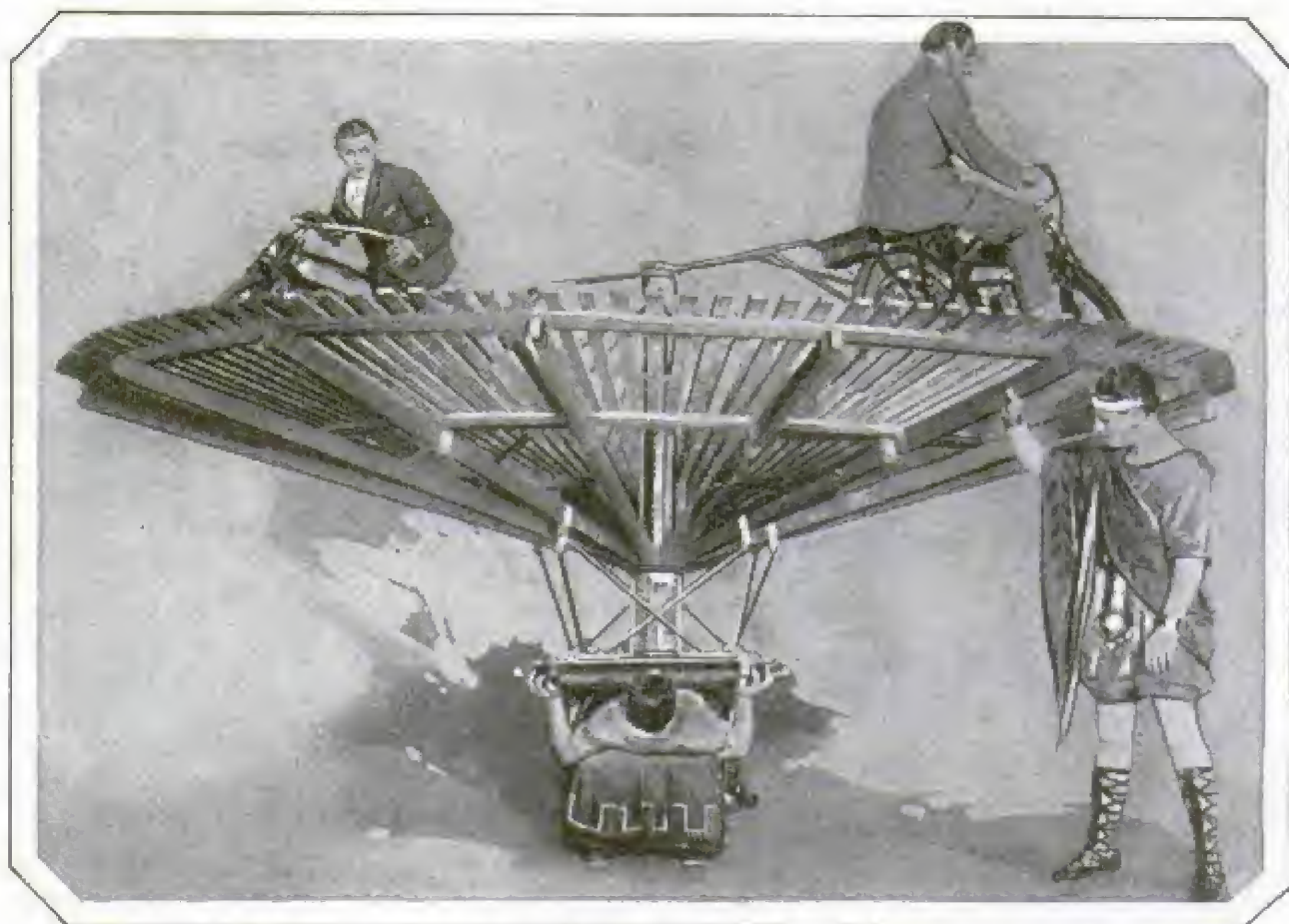
Artist's Drawing of Bubble Waterfall, Exposing Framework, Motors and Blowers, Canvas Backing and Cross Section of Bubble Cascades; Rocks Were Formed from Wire, Paper and Glue

for Mimic Waterfall on Theater Stage



Balsan & Katz

1175 N. State St. Chicago
At the Foot of the Soapy Cataract, Dancers Interpreted a Story Climaxed by the Man Plunging into the Bubbles and Disappearing; Inset Shows Details of Construction



A German "Hercules" Demonstrates His Strength, Supporting Track and Two Motorcycle Riders While Lying on His Back; Cycles Are Connected to Center as Pivot to Aid in Balancing

MAN HOLDS TRACK AND RIDERS IN STRENGTH TEST

Supporting a wooden track upon which two motorcycle riders are racing, is one of the feats performed by a German strong man. Besides holding the weight, he must help balance the load under the shifting position of the cyclists and the test is one of considerable duration, as the track must be held while the riders are getting up the speed of their machines.

DESK CLAMP FOR TYPEWRITER REDUCES NOISE AND WEAR

Features of a shock-absorber and silencer are combined in a clamp to hold the typewriter to the desk. It is easily installed and adjusted, and is so constructed that the machine is held at any angle required by typewriter desks with disappearing tops. It also permits the operator to move the machine forward when using it if desired. By decreasing the jar on working parts, it is intended to prolong the life of the



\$7.50

typewriter, reduce repair bills and spare the stenographer unnecessary fatigue. It is manufactured for different kinds of standard machines, and special clamps may be had for those with extra-wide carriages, billing devices and other machines.

ARMORPLATED INDIAN RHINOS BAGGED BY ROOSEVELTS

Specimens of the rare armorplated Indian rhinoceros, as well as royal Bengal tigers and other big game, have been obtained by Theodore and Kermit Roosevelt on their hunting expedition into central Asia for the Field Museum of natural history. They were granted permission from Indian and British authorities to enter some of the vast game preserves maintained by the rajahs after they had been successful in bagging specimens of the ovis poli and other rare game in the Pamir districts. It was in India that they found the armorplated rhinos. Some ten months were spent in the wildest and least explored regions of central Asia. At times, the hunters reached altitudes of 15,000 and 18,000 feet.

Instead of shaking hands, the Chinese wag their clenched fists.

Edward Kravitz
507 S. Dearborn
Chicago
Products Co.
12/1/26

STAGGERED CITY-TRAFFIC PLAN TO REDUCE DISEASE

To reduce the spread of colds and other communicable ailments in New York city, a plan of "staggering" the subway schedules was proposed to relieve congestion. The scheme involved different closing and opening hours for schools, places of business and other institutions so that the peak passenger load might be distributed over a greater period of time and keep individuals from such close contact in the cars. The plan was considered advisable especially because of the menace from smoke, unusually heavy at the time, on account of the hard-coal shortage. A similar arrangement was worked out during an influenza epidemic.

LETTERS WRITTEN ON SKY WITH SEARCHLIGHT

Using a combination reflecting and projecting apparatus, a California inventor has developed a new form of sky writing. Instead of employing smoke from an airplane, he utilizes clouds as a sort of screen upon which he throws letters from a powerful arc light. The characters are produced by the shape of the carbon. The instrument can be focused to points at

considerable distance and concentrates the light to insure visibility.



Inset Shows Letter "L" as It Appears Projected on Clouds from Combination Reflector and Searchlight

Model of Los Angeles Tennis Club. Showing Arrangement of Courts and Inclosure for Tournaments

TENNIS COURTS AND CLUBHOUSE BUILT FROM MODEL

As an aid to builders of a tennis club costing more than \$200,000 in Los Angeles, a "working model" of the proposed grounds, including the courts, clubhouse and swimming pool, was constructed. It was carefully planned to proper scale. One of the features of the project is a special court for tournament matches. It has bleachers for spectators, the seats being arranged to afford unobstructed view of the games from all points.

TAKE SNAPSHOTS UNDER WATER TO STUDY SHIPS

By taking under-water pictures of model ships in experimental tanks, designers are able to study the hulls as they would perform under actual conditions of use, as to rolling and other motions. This is made possible by a special method of making snapshots, developed by a Japanese. Light is furnished by exploding a "thread" of mercury under water. The material is inclosed in a narrow glass tube and sealed. Application of an electric current causes the glass to burst with light sufficiently intense to register on the negative of the submerged camera.

Mr. J. Christie
39 Charlotte St.
Canada.

305 Lucie Bldg
408-12th St.

Mr. Samuel E. W.
James, Oakland
Calif.

1353



U.S.N.

Palomar



Big Log Split after Explosion of the Gun, and Inset Showing Instrument and Charge of Powder

GUN FOR SPLITTING CORDWOOD SAVES TIME AND LABOR

Logs as large as ten feet in diameter are quickly split into cordwood size with a special gun consisting of a steel cylinder, eighteen inches long and five-eighths of an inch across. It is tapered to a point so that it can be driven into the log and a small charge of powder, which is ignited with a fuse, is inserted in the chamber of the gun. Driving the cylinder into the log compresses the explosive. One gun is said to last long enough for splitting as much as 150 cords of wood, and only about two minutes are required to load and fire it. Practically no danger attends the operation, it is said, and wood can be split for eight cents a cord.

SIDEWALK FENCES TO SAFEGUARD PEDESTRIANS

Sidewalks and roadways would be separated by "pedestrian-proof" fences, under a traffic plan offered by an eastern engineer. Walkers could cross only by bridges or tunnels, and provision is made under the project for traffic lanes, permit-

ting channels for vehicles going at high speed and others for slower speeds. Side entrances would be furnished a mile apart for entering or leaving. The engineer suggests that crossing streets be placed at different levels.

DOG TEAMS TAKE ENGINES' PLACE IN ALASKA

In the palmy days of Nome, Alaska, when millions in gold were being mined near by, a railroad, ninety miles long, was built to serve the district. Subsequently, with the decline in gold production, the rolling stock was sold and the rails were about to be torn up and disposed of when a group of public-spirited men intervened. Saving the line led to the use of dog teams instead of engines for hauling freight. Six or eight huskies can pull a quarter of a ton forty or fifty miles a day, it is said. After dragging the load up steep grades, the dogs climb aboard and ride down. The territory of Alaska has acquired the road, and it is now kept in repair by the territorial highway commission.



Dog Teams Bark Where Engines Puffed; Scenes on Railway near Nome, Alaska; the Dogs Ride down Grades with Passengers

national Safety Council Chicago

Paul H. Callahan
St. Paul, 1717 St. Paul Ave. N.D.

Ernest P. Goodrich New York City
Consulting Engineer

Housekeeping at Sea



Steward Must Be Able to Tell What Passengers Will Eat Each Meal during Days or Weeks at Sea

DO you know what John Smith is going to have for breakfast two weeks from day after tomorrow? Would you be willing and anxious to hazard a guess as to William Brown's choice of meat for dinner a week from Tuesday? Or have you any idea what you yourself will choose for next Monday noon's lunch?

Those are only a few of the problems that confront the men and women who keep house on the seas—the stewards of the big liners that ply between world ports. And not only must they be willing to guess the answer to such problems as this; they must also back up their decision by actually ordering their supplies accordingly, remembering always that there are no grocery stores at sea; that all passengers must be kept happy and satisfied; and, last and perhaps most important of all, that the profits of the voyage depend very materially upon their guesses being accurate, so that waste may be reduced to a minimum.

The figures in which those who keep house at sea deal are stupendous. The

chief steward of a big liner orders twenty-four tons of potatoes for the voyage from New York to San Francisco via the Panama canal, with fully as much unconcern as the housewife telephones to the neighborhood grocer for a quarter's worth of the same commodity. And when the ship arrives at its destination, it will be found that twenty-four tons was precisely the right amount. Scores of other commodities are purchased in the same way, and the ship sails serenely on its journey, not at all worried by the fact that there will be no further possibility of purchasing stores until the destination is reached, nearly three weeks hence.

How is all this accomplished to the satisfaction of all concerned? With a view of finding out the answer to that question, the writer sailed out of New York harbor a few weeks ago aboard the big inter-coastal liner "Mongolia," bound for San Francisco, eighteen days away. Altogether there were some 300 passengers aboard the ship. In addition, a crew of approximately 200 men manned the ship,

making a total of 500 hungry individuals to be fed, boarded, and otherwise cared for during a period of nearly three weeks. Yet so unworried by the prospect of this seemingly herculean task was the chief steward, Lewis Daughtrey, that he strolled about the deck at sailing time, greeting passengers, casually chatting with friends, and otherwise enjoying to the utmost the excitement that always attends the departure of a big passenger ship.

Out on the Atlantic, a couple of days later, with the routine of sea life settling into quiet channels, Mr. Daughtrey conducted a party of curiosity-impelled passengers down into the maze below decks to see just how sea housekeeping is effected. The first stop was made at daily-muster time, to get an idea as to just what

the steward's department consists of in the way of personnel. One hundred and seventy-two men and women were found to compose the so-called "victualing department." Here is the way they are divided: sixteen bedroom stewards; six bathroom stewards; five stewardesses; seventy waiters; three bellboys; one lounge steward; three deck stewards; three smoking-room stewards; one chef and twenty cooks; five pantrymen; seven utility men; five plate washers; one chief baker and four assistants; one confectioner; five butchers; five storekeepers; two barbers and nine miscellaneous.

Personnel being thus made somewhat clearer, equipment was the next logical investigation. Down into an amazing vastness of spotlessly clean rooms went the party. Huge refrigerated rooms of temperatures varying from eight degrees above zero to forty-one degrees, big enough to play tennis in, were found at every hand. To the amateur, classification seemed a hopeless task, but with the aid of the chief steward, they were arranged in orderly fashion as follows: a vegetable room; a fruit room; a beef room; a fish and ice room; an ice-cream room; a salt-meat room, and a butcher shop. Other rooms, not refrigerated, turned out to be a bulk storeroom; a cuddy store (to be explained later); a bake shop; three galleys (a seagoing name for kitchens), and two dining rooms, or saloons, although it should be explained that



As the Steamer "Mongolia" Glides Out to Sea, Chief Steward Lewis Daughtrey, Head Housekeeper for 500 Persons on the Voyage, Prepares Menus from Cookbooks and Food Statistics

901



Even Better Equipped than Many Such Places on Land, a Modern Liner's Hospital Is Fitted for Handling Emergency and Other Operations of Wide Variety, and for Treating All Sorts of Diseases; at the Upper Left, Is the Operating Room, Showing a Corner of the Table in the Foreground and Sterilizer at Rear; at Right, the Dispensary Headquarters with Part of Stock of Medicines and the Steamer's Chief Surgeon; Frequently, Smaller Boats Use the Radio to Ask the Doctors of the Big Ships and Those at Base Hospitals for Medical Advice



Corner of the Men's Ward in the Hospital; It Accommodates Fifty Patients, and Is Quite Comfortable

the sea name for dining room has by no means the same significance as on land.

Now just how does the sea housekeeper go about determining what to purchase for his three weeks' absence from supply sources? In the first place, he has before him a chart, based on years of experience of seagoing folk, which shows the average ounces of food consumed per person per day under certain conditions. With this, and with knowledge as to the number of passengers who are making the trip, the chief steward works out a table of "meal days"—a single figure which tells him the approximate ounces of food that will be consumed on the trip. On this particular voyage, he figured that he had 24,428 "meal days," and by multiplying this figure by the number of ounces of food averaged under the conditions through which the ship was traveling, he knew what would be required in the way of food.

With this figure determined, stores are purchased accordingly. Here is where the element of chance would seem to enter. How can the chief steward tell that Ebenezer Higgins will choose bacon and not ham with his eggs a week from Saturday? The answer

is simple; he can't. But he does know that, when you combine Ebenezer Higgins and 299 others passengers into one lot, a certain percentage will order ham and a certain percentage will order bacon, and that's all he cares. Of course, there is the possibility that Ebenezer will suddenly stand up in the dining room and declaim "the bacon's fine this morning," or words to that effect, and that every passenger in the saloon will order bacon. That brings in the next element to be considered—"overscale." Overscale is what has to be provided to offset unexpected upsets in the law of averages. Upon the careful calculation of overscale rests largely the financial success or ruin of the steward's department for the voyage.

And so the various commodities required for the three weeks' trip are purchased and stored away in the various rooms heretofore enumerated. The next thing to be considered is the daily menu. This is much more difficult than on land. Ashore, people are busy and engrossed in many activities. If the meal is, on the

Corner of the Butcher Shop, as important to the Ship Dweller as is its counterpart on Shore; Below is the Steamer's "Cuddy Store," Operated like a Grocery on Land; Various Cooks Call on the Storekeeper to Get Their Day's Supply of Groceries



average, satisfactory, there is no complaint. But at sea, especially on a long voyage, the passenger is not as a rule busy. He plays his deck game; reads his books, and relaxes. He has ample time for contemplation of many things, including food. He is likely to be in a supercritical mood regarding his meals. Hence every precaution must be taken to insure complete variety and to cater carefully, for meals, perhaps more than any one other thing,

make the success or failure of the trip and, eventually, the success of the steamship line. The menus are made up far in advance—perhaps as much as a week. The chief

Panama by train, and deliver them back aboard the ship before it leaves Balboa, the other end of the canal, six hours later. Likewise the supply of linen must be maintained, and other housekeeping problems of this nature attended to.



Steamer Pastry Chefs Are Adept at Fancy Creations; Replica of Eiffel Tower in Sugar

steward, upon compiling them, distributes copies to the butcher, the baker and others concerned. Here is where the cuddy store mentioned above comes into the general scheme. This is in reality a complete grocery store, with storekeepers in charge. They issue the various commodities just as does the neighborhood grocer. Each night the storekeeper, the butcher and the others render an account to the chief steward. Not only does this show the quantities issued, but also the quantities left on hand. If there is an unusually heavy drain on one commodity, menus can be arranged accordingly; similarly, an oversupply of an article can be corrected.

Thus goes the problem of meals—the main consideration of the steward's department. That by no means ends his worries, however. Under his supervision come such questions as the scores of bedrooms, bathrooms and living quarters aboard the ship. Laundry, in terms of thousands of pieces, must be considered. On this particular route, provision has been made to take as many as 100,000 pieces of laundry from the ship at Cristobal, the eastern end of the Panama canal, rush them ashore by small boat; launder them; rush them across the isthmus of

Housekeeping at sea does not end with the steward's department, however. The medical end of the ship's welfare must not be overlooked. So the ship's doctor arranged a tour in another part of the below-decks maze. Here was found a complete operating room with the most modern surgical equipment; wards for both men and women, each capable of accommodating fifty patients; two dispensaries, fully as complete as any drug store ashore, and an isolation ward for any contagious diseases that may develop during a voyage. Nurses are part of the ship's complement.

Many other minor items are involved in successfully keeping house on the ocean. There is the ship's printer and his plant, equipped to do elaborate jobs of printing, including the daily table menus, programs for the ship's masquerade and deck-sports tournaments; passenger lists and countless scores of other odd bits of printed matter. There is the daily news, broadcast from shore stations each night, received by the radio operator, and posted frequently, so that passengers far from land are kept as fully informed as the man in the center of the metropolis with its many newspapers. There are dozens of other details involved in successful housekeeping at sea, and the net result is that, when

a sleek liner glides gracefully out of a harbor, whether bound for Southampton or Singapore, San Francisco or the Straits Settlements, it is so organized and so equipped, both in facilities and personnel, that housekeeping can be carried on just

as successfully and just as efficiently a thousand miles at sea as it can in the neighborhood home, next door to the grocery store, the butcher shop and the family doctor.

SILK FROM SHELLS OF INSECTS RESISTS ACTION OF ACIDS

German chemists are reported to have prepared a substance from which artificial silk can be made out of the shells of crabs and lobsters, and from claws, feelers, heads and similar hard parts of various insects such as wasps, beetles and grasshoppers. The substance is said to furnish a base that yields fibrous, plastic masses of sufficient strength to obtain a product more nearly resembling silk than that now made from cellulose. One of its qualities is that it shows remarkable resistance to chemical action of all kinds. The hairs or filaments can be produced to every degree of fineness, it is said, and the same basic material, when poured upon glass and permitted to evaporate the ingredients used to dissolve it, produces a film which can be bent and folded. While tests with the product have been largely confined to the laboratory so far, much wider development is predicted.

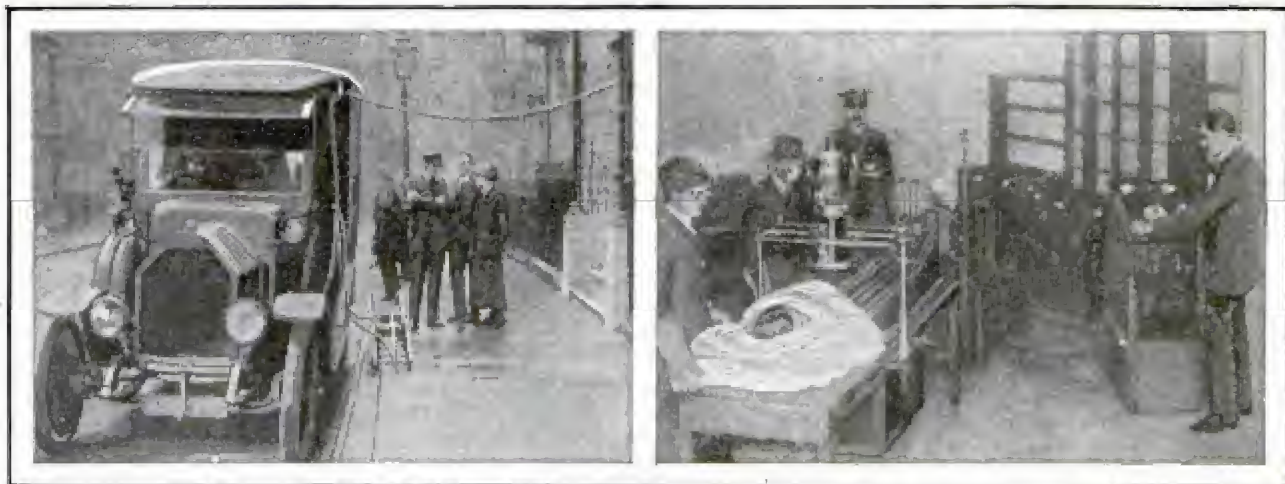


Upper View Shows Corner of One of the Ship's "Galleys" or Kitchens; Below, the Captain's Table in Main Dining Salon, Decorated with Fresh Flowers, a Luxury of Modern Sea Travel

X-RAY OUTFIT CARRIED IN AUTO SERVES PATIENTS AT HOMES

Use of the X-ray in determining the extent of injuries, and in various other diag-

or fails to burn. Different sizes of lamps are used according to the kind of test involved. The outfit can be used with a rectifier in charging wet radio B-batteries by connecting one test point to the lead



Courtesy London Illustrated News

Portable X-Ray Outfit in Use; Truck Is Driven to Patient's Door and Apparatus Taken to Bedside for Making Photograph While Operators Keep in Contact by Phone

noses, is considerably extended by means of a portable outfit which has appeared in London. It permits taking photographs of patients in their homes, saving costly and sometimes disastrous removal to hospitals or laboratories. The entire equipment is carried in an automobile. Parts necessary for use at the bedside are taken into the house and connected to the main apparatus with a cable. The doctor telephones necessary instructions to an operator in the automobile while the photograph is being made. The exposure is then developed in a special darkroom compartment in the rear of the automobile.

TROUBLE FINDER SERVES ALSO AS CHARGER

For locating open or short circuits, and other obstacles to the operation of a wide variety of electrical equipment and wiring, a testing set now on the market is easy to use and is quickly put into service. It consists of a pair of testing handles with removable caps so that different sizes and lengths of lead wires may be inserted, two points of a special alloy intended not to break or corrode, and a special socket with separable plug that fits any standard lamp socket using either alternating or direct current. Positive evidence as to the location and nature of the trouble is afforded as the light used with the testing set is illuminated

electrode of the rectifier and running a jumper from the aluminum electrode, to the positive post of the B-battery. The other test point is connected with the negative post of the battery. The current is then turned on, the size of the lamp used as resistor depending upon the number of cells in the battery. To charge a twelve-cell battery, for instance, requires the use of a forty-watt lamp, while a sixty to seventy-five-watt bulb is needed for a twenty-four-cell battery.



Electric Testing Outfit in Use and Drawing of Its Parts, the Lamp, Cable and Two Points with Insulated Handles

Universal Test Equipment Co.
2939 N. Oakley Ave

1334 Double Camera for Long and Close Shots; Upper Instrument Is Turned by Motor



DOUBLE MOVIE CAMERA TAKES LONG AND CLOSE SHOTS

Saving the need of two tripods and two photographers, a double motion-picture camera is expected to simplify the making of films, especially in panoramic work. One of the cameras is cranked by hand while the other is turned electrically. Perfectly matched negatives are thus obtained at the same time, one instrument being set

for close-ups and the other for longer shots. This arrangement greatly helps when panoramas of more than 180 degrees are taken, as two cameras under such conditions come within photographic range of each other, thus spoiling one of the negatives.

American City 2/26/26

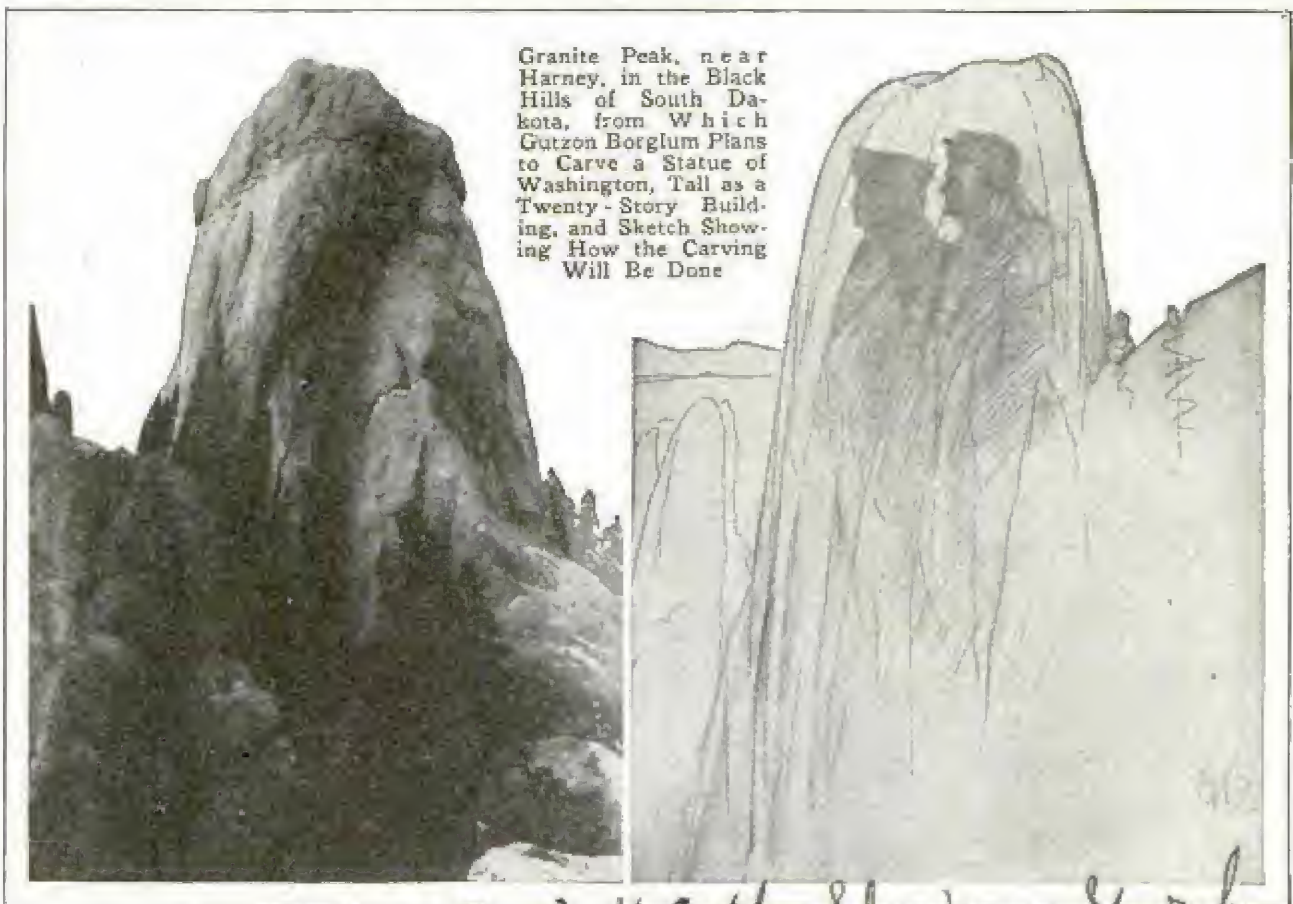
1815 ROOF OVER FOUR BUILDINGS PLANNED FOR AIRPLANES

What effect will aviation have on city architecture? That it gives promise of modifying skylines and causing the development of special types of buildings is seen in a series of sketches submitted in an eastern competition to meet the requirements of landing fields for airplanes in city districts. The plans are based on the assumption that planes will be able to rise and descend vertically, the much-desired feature now being sought in helicopters of various designs. The prize-winning sketch involves the use of high, terraced buildings acting as huge supports for the landing roof proper. These buildings would stand on a plot about 1,400 feet square and would rise like towers to a height of 950 feet. There would be one tower on each side of the plot. All would be covered by a superstructure, intended to rise 300 feet above the tops of the supports and provided with a level, thirty feet below the landing roof proper, for repair shops, waiting rooms and other accommodations for passengers and mails.



Prize-Winning Sketch of Landing Fields for Airplanes in City Districts

Beaux Arts Institute



Photos © Publishers' Photo Service,

105 W. 40th St. New York.

Nation's Parks Lure Auto Tourists Westward

Millions Tour Each Summer Famous Scenic Spots of the Rockies
Where Auto Roads Have Succeeded Pack-Train Routes

SOME millions of automobiles between the Atlantic and Pacific are being tuned up this spring for the annual migration to the scenic wonders of the west. There are three or four million cars in California and the western states, a large number of which are near enough to the national parks for week-end trips. Added to these are several hundred thousand which make the overland trip each year from the east and middle west.

The main roads to the Yellowstone, Yosemite, Glacier and Grand Canyon parks take the bulk of the travel, but constantly increasing numbers are turning aside to the less widely known, smaller, but often more beautiful small parks, both national and state, and to the historical spots throughout the west.

The project started by Gutzon Borglum, first sculptor of the Stone Mountain memorial near Atlanta, for 200-foot-high statues of the builders of the nation—Washington, Lincoln and Roosevelt—in the Black Hills of South Dakota has awakened interest in one of the most pictur-

esque spots in the west. The Black Hills region is famous for its grotesque buttes, queerly eroded cliffs and nightmarish stone mountains, all on a gigantic scale. Off the usual traveled routes, and forming, as they do, an orphan range, their nearest mountain neighbors being the Big Horns of the Rockies, far to the west, they have escaped the worst effects of too much development and too much tourist traffic.

Within the region which is to be made famous by Borglum's statues lies the little town of Custer, where the noted general made his headquarters just prior to his last fight, and the town of Deadwood, famous as the wildest and woolliest mining camp of its day. Around about them are the Wind cave and Jewel cave parks, Custer state park, many small caves, sylvan lakes, tree-clad mountains, and, dominating all, the vast time-scarred granite buttes, rising in strange peaks and pillars. At Harney peak, near the Needles, where the Borglum statues are to be carved, the fire rangers' station, on Lookout summit, is 7,340 feet above sea level, the most siz-



able mountain height east of the Rockies. The top of the gigantic Washington statue, more than 200 feet high, will be almost as high up as the tallest peak in the Rockies, while from a level with the eyes of the first president, the visitor, on a clear day, can look out over the three states of South Dakota, Wyoming and Montana for a distance of 200 miles, and even see the famous Devil's Tower, over near Sundance, Wyo., one of the strangest rock formations outside the Garden of the Gods. Some 600 feet high and nearly a mile around at the base, its eroded sides rise straight up for most of their height, flaring in at the top and out at the base. Round the sides it is grooved by time and storm in a series of gigantic pillars, five-sided, as a rule, and over six feet thick.

Like most of the natural wonders of the region, it is explained by an old Indian legend, which claims that three Indian maidens, out picking flowers, were attacked by a gigantic grizzly. They sought refuge on a low hill and, when the bear pursued them, the gods caused the rock to grow up out of the ground. The bear climbed and climbed, but the rock kept on growing until finally the exhausted animal slipped back and was dashed to death below. The Indian maidens then made ropes of their flowers and lowered themselves to the ground. The deeply eroded marks in the sides of the rock were left by the bear's claws, the legend explains. The Indians still believe that, during storms, the thunder god takes his drum to the top of the peak and beats it.

The fastnesses of the Black Hills country were the home and hunting ground of the Sioux tribe long after white men had opened the main traveled trails to Oregon to the south. West of them, in the Devil's Tower country, were the Crows, and through the hills the two tribes fought their wars.

Custer, Sitting Bull, Wild Bill Hickok and Calamity Jane, have left their stamp on the district. At Deadwood, where Wild Bill was killed, he is buried on Boot Hill, and near by is the grave of Calamity Jane.

The Custer state park is not so large as some of the national parks to the west, but embraces many of the features of Yellowstone, both in natural scenery and big game. Herds of buffalo, elk, deer and bands of big-horn sheep roam its meadows and peaks. In the region between the Cheyenne and Belle Fourche rivers there is as variegated scenery as any place in the country may boast.

The caves rival those in other famous cave sections. Wind cave, a national

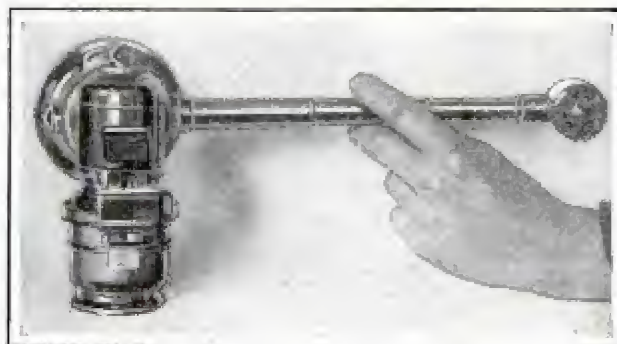
monument, was discovered by a cowboy roaming the hills when he was attracted by the whistling of the wind through the entrance, which has since been much enlarged to afford easy ingress to tourists. More than a hundred miles of its passages, studded with glittering crystal formations, have been explored. Jewel cave, not far away, boasts 1,500 chambers of mystic beauty. Miniature lakes and weird crystals built up through the centuries give each a distinctive charm.

To the southwest, the national Old Trails road, embracing the famous Santa Fe trail, opens up the land of the Hopi Indians and the cliff dwellers to tourists, along with the Grand Canyon, petrified forest, the artists' colony at Taos, New Mex., and side trips to the parks around Denver. The snake dance at the Hopi village attracts an increasingly large attendance each year, despite the long drive across the desert on a most primitive road.

Motor roads in many of the mountain states are excellent. Those through the Black Hills have not only been carefully built, but were designed to give the maximum of scenic enjoyment.

HEAD AND REAR LIGHTS IN ONE SAVE EXTRA LAMP 120 /

With a telescopic tube at the side, a headlight for bicycles or for use on automobiles, eliminates the need of a separate lamp for the rear. A red lens at the end of the tube glows from the reflection of the headlight. The extension may be closed during the day or when it is not needed. It collapses, fitting close to the side of the larger lamp.



Combination Head and Rear Light: Extension Is Illuminated by Reflection from Large Lamp

Boots and Broad Skis as One Protect the Sportsman's Legs and Feet and Simplify Mastery of the Healthful Amusement



BROAD SKIS FITTED WITH BOOTS 1349 KEEP FEET WARM

Roomy boots of a leatherlike material are attached to toboggan-shaped skis now on the market to keep the feet warm and to give a more secure footing. They snap and fasten about the legs, to keep snow from sifting in, and there is a foot harness within each boot. Being wider than the ordinary type, the skis are said to afford more riding power over deep fluffy snow. They are made in varying widths and lengths, the pair shown in the illustration being eight inches wide and four feet long.

☞The name Siberia means "thirsty."

Northern Specialty Co., Milwaukee

*Institute of Patentees
Esreal Gussell St.*

ATHLETES ROLL INSIDE WHEEL TO EXERCISE MUSCLES

Exercises at a physical-training school in Germany include periods with a unique wheel in which the athlete stands and makes complete revolutions by pushing



Wide World.
Sport and Beneficial Exercise in Novel Combination. Rolling inside Hoop Brings Many Muscles into Play and Develops Balance

and bracing against the rim. His feet are secured in sandal-like supports and he holds to the opposite side of the wheel with his hands. Grips are so arranged that his fingers will not be scratched or bruised as the wheel turns for they are on the inside of the frame. The task of rolling the apparatus in this way, is said to exercise many muscles that do not receive development with other kinds of equipment. It may be used indoors or out.

GAUGE LIGHT'S CANDLEPOWER WITH GREASED PAPER

Rating of candlepower of light is based upon a standard "candle" which is specified by a British law that deals with gas and electric-lighting undertakings. It provides that the candle shall be a uniform one made from spermaceti or whale oil, weigh six to the pound and burn at the even rate of 120 grains an hour. In measuring with this standard, a thin sheet of special paper in the center of which is a waxed or greased spot is used. The paper is held upright in a frame and on either side, at the exact level of the greased spot, is placed the standard

candle and the one to be tested. Both lights are then moved backward and forward until the greased spot is no longer visible on either side of the paper. When this occurs, it is known that the lights diffused on each side of the paper are of equal strength. The standard candle and the one being tested are probably at different distances from the paper. The former may be only a foot away while the other may be four feet. If it is, its light is four times as strong as that of the standard candle and since it illuminates sideways as well as lengthwise, the distance must be squared to give the full measurement, or sixteen candlepower, of the tested light source. However, since the standard candle, no matter how carefully made, is not always entirely reliable, the measurements now are usually made with a lamp which has a light emission equivalent to that of ten standard candles.

AMBULANCE FOR SICKLY DOGS TENDS PETS OF POOR

Medical care for the pet dogs of poor persons in London is now given at one of the public dispensaries. The animals are collected in a special ambulance fitted with compartments that hold them securely without injury and to prevent shock and jars in case they are wounded.



Placing a Dog Patient in the Ambulance; the Carrier Has a Special Folding Top to Hold Occupant Securely

*William Branch
People's Dispensary London*

*Blade & Ledger
march 1926*

1184

Harbor Pirates



By FLOYD TAYLOR

*City Room
Herald Tribune, New York.*

PIRATES in New York harbor cost the shipping industry \$1,000,000 a year. Life on the Spanish Main was dull compared to that of a modern river pirate in New York, and Captain Kidd was no more careless with other people's property than those who follow him in 1926.

These assertions were made at a meeting in New York of the Maritime Exchange committee on marine and waterfront property. At the meeting shipping men, and men representing the city, state and federal governments, decided on forming a committee to determine means of fighting the pirates.

Some skeptical persons were inclined to doubt that pirates could operate in the midst of millions of people, in a harbor carefully protected by police boats and the coast guard, but the records show that these thieves are active, ready to use their guns and successful in robbing craft under way and ships and barges tied to docks. Here is a case of harbor piracy:

Twelve men in a fast motor launch tied up one night to the stern of the steamship "Bridgeton," lying at a Brooklyn pier. They climbed aboard without the knowledge of the crew. At about 11:00 o'clock, a sailor walked aft and was seized

and bound. The pirates, wearing rubber-soled shoes, crept forward. Not a member of the crew knew anything was wrong on board until he was grabbed, had a gag thrust into his mouth and was bound with hard thin ropes cut from the lifeboat davits. The prisoners were locked up in the mate's cabin.

The last man taken by the pirates was the watchman on duty in front of the ship's strong box. He was manhandled so that he had to spend the next few days in a hospital. The custom officer on duty on the dock was seized as well as the assistant engineer, who had been on shore leave and returned to the ship while the pirates were working.

The twelve bandits cut through the heavy steel hinges of the ship's safe with an acetylene torch, which they operated under cover of a tarpaulin. Their loot consisted of precious metals valued at \$12,000. There was one box of platinum and two boxes of unrefined gold and silver dust, the remnant of a metal cargo valued at \$150,000. When the pirates had emptied the strong box, they escaped in the motor launch.

Piracy flourished in New York harbor especially during the early part of the

1184



View of East River above Brooklyn Bridge at Right, the Type of Waterfront in Which the Harbor Pirate Works; Piers for Railroad Barges Back of Warship

World War, but the police got it under control for a time. Some years ago it flared up again, and now ship owners say it is as flourishing as in the days when pirates strung their victims to the yardarm or bade them walk the plank.

The river pirate will steal anything from a piece of rope to ten tons of coal. He usually works from a motorboat of from fifty to a hundred horsepower. A few of the boats are equipped with Liberty engines and some of the harbor pirates also engage in rum running. Some of them have deserted piracy for rum running, or to "high-jack" the rum runners, but their places have been filled by other criminals.

A long string of coal barges started at night, in tow of a tug, from a coal pocket on the New Jersey shore of the Hudson, bound for a Manhattan dock. On the tug there was the usual crew of twelve men and on each of the barges a captain to

tend to the lines and act as watchman. Five river pirates in a dull-gray boat, with racks carrying rifles and revolvers and with bullet-proof glass in its port-holes, followed the string of barges as they plowed along at three or four miles an hour. In mid-stream, the pirates ran their craft above the last barge, cut out the motor and allowed the boat to drift down on the barge. A moment later three shadowy figures plunged through the darkness against the barge captain. He was gagged before he could cry for help.

While he was stretched bound in his cabin, the pirates shoveled ten tons of coal to the deck of their boat. In the morning they sold it to peddlers on New York's east side, or to coal dealers in some small town on the waterfront near New York.

Cargoes are stolen from barges at their piers. The pirates will take anything that is salable, lumber, wool, hides, coffee, tea,

1184



Custom Agents Inspecting an Armored Motorboat Shelled by Machine Guns Before Being Captured and Relieved of Its Contraband Cargo: Bullet-Proof Glass Withstood Heavy Fire



One of the New Speed Boats for the Dry Fleet. Making Thirty Knots an Hour during a Trial Run



Towing Coal Barges Past
the Statue of Liberty:
Like Sea Robbers of Olden Times, Harbor
Pirates Sometimes Plunder These Craft While
in Motion

silk, sardines, canned fruit or even the ropes that tie the barges to the docks. Barges have drifted into the harbor to be wrecked by passing ships or go aground as a result of harbor thieves taking their ropes. The rope on one barge is worth several hundred dollars.

The barge companies cannot afford to arm their vessels and employ special police, the shipping rates are too low. The marine division of the New York police department does its best and occasionally breaks up bands of the pirates, but its task in guarding more than 500 miles of waterfront is a tremendous one.

In addition to the passenger ships and freighters in the harbor, the police have to guard thousands of barges, hundreds of tugboats and an endless list of small craft. One of their jobs is to catch rum runners. The coast-guard force protecting the harbor is well equipped with high-speed boats. Its main work is to capture the rum runner, who may be a pirate on the side, but the guard is ready to go into

action against the pirate who is not a rum runner if necessary. Some time ago a watchman on a Jersey pier saw two men climbing aboard a railroad barge, weighted down with cars containing valuable shipments. He shouted at the men as he drew his revolver. The reply was a bullet that passed through his coat. He emptied his revolver at the pirates as they dropped to the deck of the motor launch and sped away from the dock. The crews of a police boat and a coast-guard vessel heard the shots and gave chase. The pirates opened up their engine to the limit and roared down the river.

The police boat was outdistanced, but the coast-guard chaser gained gradually and opened fire with a machine gun. One of the pirates knelt in the stern of his boat and tried to pick off the machine-gun



A Rum-Running Craft Comes to Grief;
Captured after a Battle at Dawn off South
Brooklyn, a Fifty-Foot Cabin Cruiser Being
Unloaded of Its 150 Cases of Whisky

crew with a rifle. The pirate craft shot into the Buttermilk channel between the Brooklyn shore and circled Governor's island twice, with the gun battle continuing. The chase was ended when the motor of the coast-guard boat suddenly broke down.

One of the most highly organized gangs of river pirates that ever fought for loot in the harbor was broken up a few years ago by the police. In the trial of several of the men in the federal court, it was charged that they had stolen goods worth \$6,000,000 from ships, barges and railroad cars in riverfront yards, in the years 1919 and 1920 alone.

Forty-eight men charged with being members of the gang were indicted in June, 1920, and during the next year, twelve of them pleaded guilty. Two ring-leaders and two minor members of the gang were convicted in 1921, the specific charge being the theft of 375 bolts of worsted from a freight car in May, 1920. The United States attorney told the jury

in the case that the pirates had maintained regularly a fleet of three barges and four launches in the river and had train crews in their employ on every railroad entering the city. On the river, the prosecutor asserted, the members of the gang either bought the collusion of barge captains and watchmen, or forced them by threats to permit thefts. The gang disposed of its stolen merchandise in the south, and the amount was so great it affected the market price in some localities.

During the winter of 1921-1922, a fleet of 164 shipping-board steamships, anchored in the Hudson river at Peekskill, was looted of furnishings and supplies valued at \$400,000. Secret-service men believed that most of the loot was carried from the ships across the ice to shore after the river had frozen. Most of the ships were fully equipped before they were looted and some were almost stripped of furnishings by the pirates. Among the articles taken were brass deck fittings, engine-room brass and copper, table linen,

silverware and bed linen. The river pirates sometimes work from shore when they believe this method offers them a better chance of escaping, but most of their robberies are from the water.

Five watchmen were inadequate to protect \$100,000 worth of opium which arrived from Turkey in a shipment to a New York druggist. Three of the watchmen were on a pier at which the ship was tied up, at the foot of Congress street, Brooklyn. The three were captured by eleven young river pirates and bound with wire. The other two watchmen were overpowered near the storeroom where the opium was kept. The pirates went directly to the place where the opium had been put, picked up the cases and walked away. They were out of sight before any of the watchmen could wriggle from his bonds. On one side of the pier the steamship was moored and on the other side there were two lighters, but neither the members of the steamship crew nor the lighter captains heard the pirates at work. The pirates who are captured usually are

tried for robbery or grand larceny, although it is possible that an indictment for piracy might be obtained.

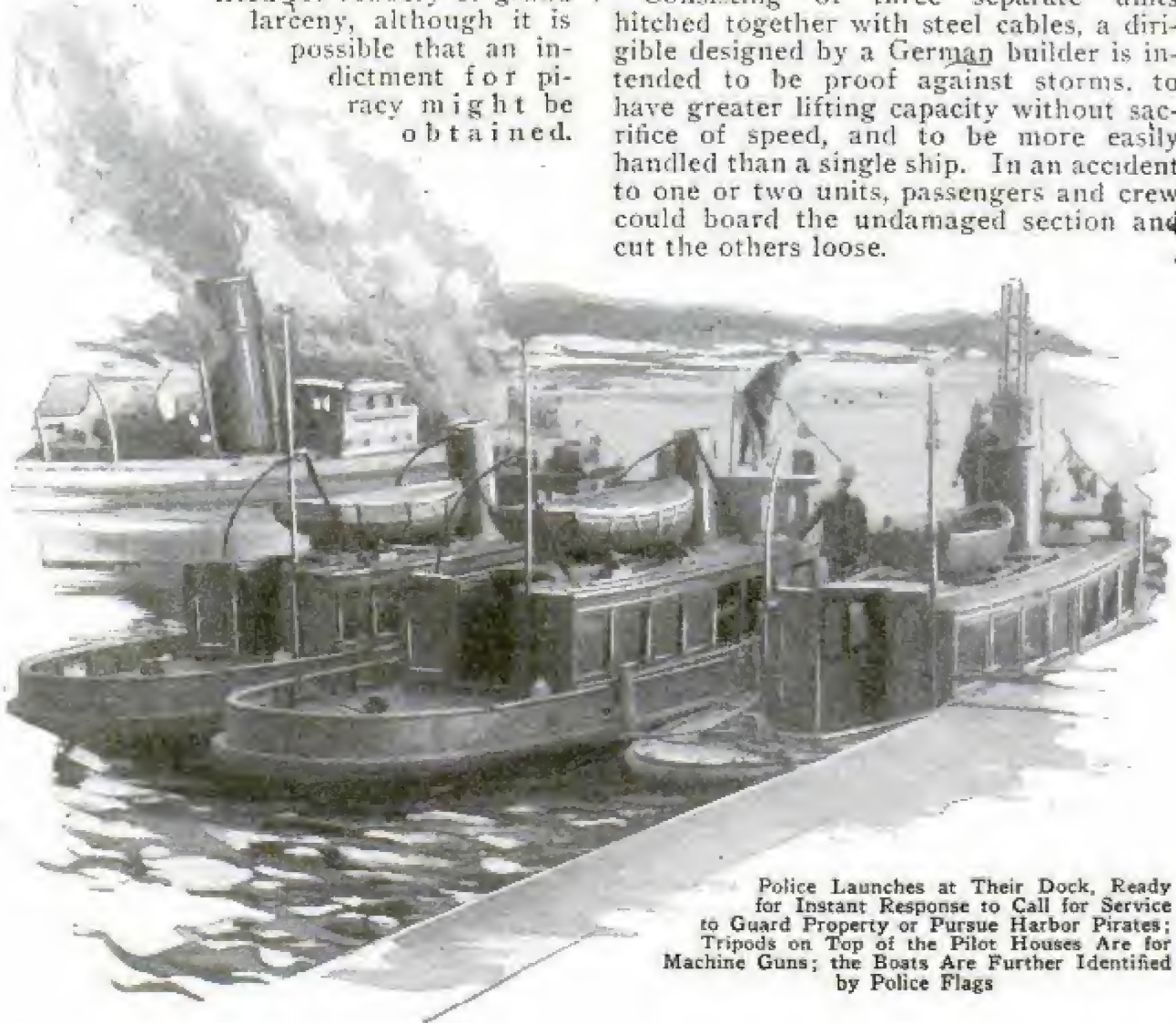
There is confusion in the law, and prosecutors hesitate to attempt to get convictions for piracy because the penalty is death and juries in New York are known for hesitancy in bringing verdicts which mean the death penalty. Under the revised statutes of the United States, it seems harbor pirates might be convicted.

The most vicious of the criminals in the harbor are the rum runners and high jackers who prey on the former. When these engage in piracy, the police-patrol and coast-guard boats must be prepared to fight heavily armed men in launches whose speed equals the best of those of the protectors of the harbor. Some of the rum boats are armored with steel and have portholes of bullet-proof glass. Several of them are converted submarine chasers.

Take it all in all, the marine police believe the saying that "the policeman's life is not a happy one," is right.

BIG DIRIGIBLE IN THREE UNITS FOR ADDED SAFETY

Consisting of three separate units hitched together with steel cables, a dirigible designed by a German builder is intended to be proof against storms, to have greater lifting capacity without sacrifice of speed, and to be more easily handled than a single ship. In an accident to one or two units, passengers and crew could board the undamaged section and cut the others loose.



Police Launches at Their Dock, Ready for Instant Response to Call for Service to Guard Property or Pursue Harbor Pirates; Tripods on Top of the Pilot Houses Are for Machine Guns; the Boats Are Further Identified by Police Flags

By Baron Otto von Lützow, Berlin, Germany

1184



Gutzon Borg-
lum with Mod-
els and Cast of
Proposed Cowboy
Statue for Texas

BRONZE MEMORIAL TO COWBOY TO STAND NEAR THE ALAMO

Resting on a granite base, twenty feet high, a bronze memorial to the cowboy of pioneer days, designed by Gutzon Borglum, will depict a scene from the range, two cattlemen on horseback with part of a herd of longhorns at the side and rear. Other views from the days of the cowboy will be represented on panels at the foot of the monument. The bronze figures will be fourteen feet high. The statue, which will stand near the famous old Alamo, at San Antonio, Tex., is expected to cost in the neighborhood of \$100,000.

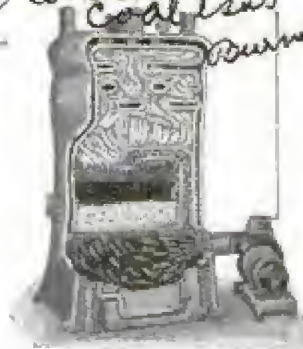
FIVE HUNDRED KINDS OF WORK OPEN TO AMERICAN WOMEN

From a study of the employment conditions of more than 340,000 women in the past seven years, the women's bureau of the department of labor has found that female workers are now admitted to 537 different occupations in this country, or all but thirty-five of the total number listed by the census reports. The survey shows that there has been a steady decrease in the number of women engaged in domestic and personal-service activities, while the greatest increases have occurred in the clerical and professional occupations. It was found that seven out of every ten single women who live at home give their money to their parents, getting back for themselves only what can be spared after the family needs have been

met. The reports showed that about four out of every five women in industry are single. According to Miss Mary Anderson, director of the bureau, industries are being found which offer women not only a living wage and opportunities for advancement, but which base the pay on the job itself and not on the worker's sex.

BLOWER FOR BURNING GASES 1290 REDUCES FUEL BILLS

Easily installed in front of the ash-pit door, a blower unit for furnaces that burn small sizes of anthracite coal, is said to increase greatly the efficiency of the fuel, as it ignites gases that ordinarily do not burn but pass up the chimney and are wasted. It is so arranged that the extra supply of air it affords is heated and provides the necessary oxygen for the combustion of the gases arising from the fuel bed. No changes are necessary in the grates or dampers of the ordinary furnace for installing the blower, and its use permits burning small sizes of coal that could not be practically consumed without it.



Our Bureau of Information will answer all questions regarding articles appearing in this magazine.

Mary Anderson, Director

General Heating Corporation
 1329 6th Street S.
 Minneapolis, Minn.



Copyright, Harris & Ewing

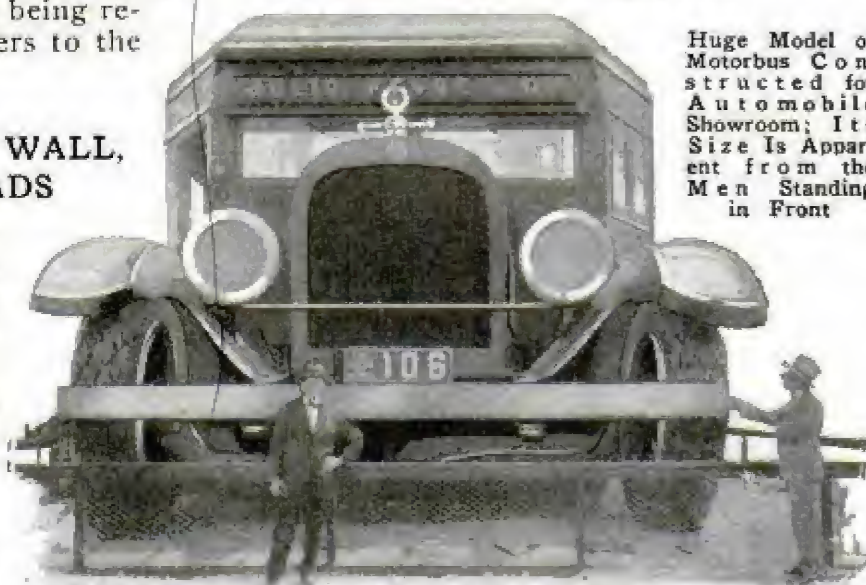
**For Faster Mail Deliveries; Operating Combination Letter Facer, Stacker
and Stamp Canceled in Washington Post Office**

LETTER STACKER AND CANCELER SPEEDS HANDLING MAIL

Letters are stacked, faced and canceled in a continuous operation by an improved device installed in the post office at Washington. It was designed by an expert in the department and is expected to save much time and many dollars annually in handling Uncle Sam's vast mail. Its chief development over other devices of the kind is the canceling feature. Formerly, after the letters had been faced, that is, arranged uniformly as to back and front, and stacked, the stamps had to be canceled in a separate machine. All three steps are now accomplished in this one unit. Tests have shown that it has a capacity of nearly 130,000 letters a day. It is practically automatic in operation, men being required only to feed the letters to the mechanism.

GRINDSTONES FORM WALL,
CHURCH AND ROADS

Hundreds of old grindstones discarded by a large eastern tool works were broken up and used to build a wall around the plant, and more than 2,500 of them were shaped to fit into a church structure. Those that could not be employed in building were used as foundation material for roads within the area occupied by the factory.



Huge Model of Motorbus Constructed for Automobile Showroom; Its Size Is Apparent from the Men Standing in Front

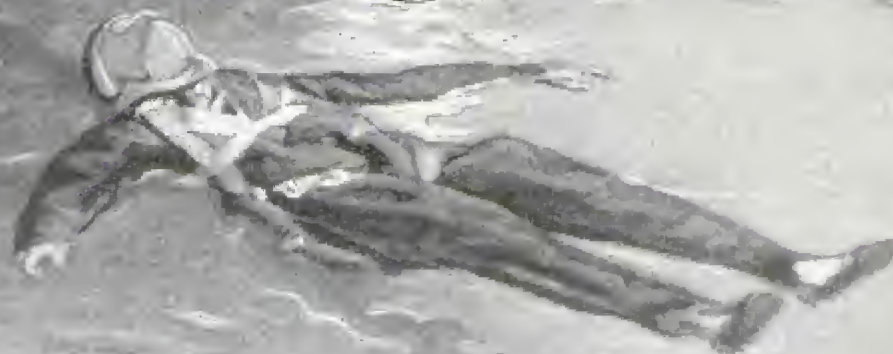
MODEL OF GIANT MOTORBUS SERVES AS SHOWROOM

As a display room during an automobile exhibition, a South American dealer constructed a huge replica of a motorbus. It was 100 feet long, the wheels were over nine feet in diameter and, over all, the bus was thirty-seven feet high. Space was provided for showing more than 100 touring cars. The designer did not reproduce engine and other working parts.

Henry Weston & Sons
Inc. Philadelphia

Julio Hevre. Lodge
Bras. agent.

Clothing the Flying Man



For the Seagoing Flyer, the Air Service Provides a Fur-Lined Non-Sinkable Suit Which Affords Both Warmth and Safety in Event of an Accident While Flying over Water

By TRUMAN B. MILLS

ACCORDING to Chinese tradition dress was originally for ornament. The protective factor was probably given scant consideration. Thousands of years of experience in clothing ourselves have established for us the proper apparel for everyday use in the different seasons, but no such experiences can be drawn upon by the flyer in working out clothing for himself, since the airplane is less than twenty-five years old.

If adornment came first and protection last in determining the kind of clothing worn by our ancestors, the procedure has been reversed in the development of the clothing for the aviator, for at present comfort is the principal factor. A visit to the equipment section of the Air Service at McCook field, Dayton, Ohio, gives an insight into the latest developments in clothing for air navigation. R. C. LaVan, who is in charge of the experimental work in clothing, declares that new discoveries of value to the flyer are being made constantly.

For instance, he declares, practically every kind of hide of domestic and foreign fur-bearing animals has been experimented with in determining the best lining for the winter suit of the aviator. And as a result of these experiments it has been found that the skin of the fawn reindeer makes the best lining.

Mr. LaVan has a large chest in the laboratory, in which are stored a variety of pelts of beauty and varying degrees of utility from the backs of the Australian and Tasmanian opossum, the gray wolf of the north, the common muskrat, the wolverene of Michigan, the Chinese sheep and goat, the hair seal, and other fur bearers. All have been put through tests to find out their serviceability, and wherever they have been found useful, they have been incorporated into some part of the flyer's attire or equipment.

In developing a suit, the engineering division meets the same difficulties as do other branches of the government as regards cost. A nutria-lined winter suit costs around \$250, so efforts are being made to develop a suit without the customary fur lining, in the hope of reducing the cost. Nutria is the skin of a South American animal.

One of the new experimental suits has an outer shell of cape leather (domestic sheep), an inner lining of chamois, and a lining next to the body made of single blanketing. This is said to be warm, durable, of light weight, and, last but not least, comparatively low in cost. Many of the winter suits have an outer shell of half Bedford cord and half leather. The leather is from the waist up. Bear hide has been used for lining suits, but it is not

satisfactory, because the hairs stand out when the hide gets cold. Wolverine hide is the best for standing the cold. The skin will not freeze and the hair will not become frosted from the breath. This fur is used extensively on the sleeves of parkas, worn in the Northland.

Fur-lined gloves, moccasins, helmets and sleeping bags are other items in the cold-weather equipment of the aviator. Gloves lined with northern-wolf fur are standard equipment with the winter clothing. The right-hand glove is often slit across the palm, permitting the aviator to thrust out his hand for writing, without removing the glove.

The moccasin worn by the aviator would bring a sigh from the American Indian, who was a great artist at designing this form of foot covering. It is seventeen inches high and made of moose and elk hide. The lining is of fur. One of the best-looking helmets used is made of coon skin. Another interesting helmet is for the accommodation of radio receivers.

Although elaborate clothing must be worn in cold weather, the summer suit is very simple. The best one developed so far is of worsted gabardine. This material is treated so that it is absolutely waterproof. One of these was given a twelve-hour water test at McCook field, the arms and legs being tied shut and water placed inside of the body of the garment. At the end of the twelve hours, the water was poured out and the suit was found to be perfectly dry.

There is still another article of clothing that is proving a boon to all who do any flying over water.

That is the unsinkable suit. Previous to the designing of this equipment, a flyer wore a vest, or vest and coat, lined with a cottony substance called kapok. These garments proved to be too bulky, so a substitute was sought. The suits now used are lined with so-called "Chicago foam," a spongy rubber, very light and non-absorbent. The ordinary sponge rubber absorbs water, but the foam may be kept under water for days without taking up any moisture.

A special suit was developed recently for altitude work. It has an outer shell of cape leather, a lining of chamois, another lining of blanketing, and an inner lining of fawn reindeer. This suit weighs sixteen pounds. It is made to keep the flyer warm in a temperature of seventy degrees below zero.

Electrically heated clothing may be worn by flyers, with electrical pads in the shoes, gloves, over the shoulders, and at various places around the body. It is the tendency, however, to get away from electrical heating and develop clothing that will keep in the heat of the body and keep out drafts.

The two-piece winter suit shown in one of the pictures tells a tale of the clothing designer's effort to get a garment that conforms somewhat to civilian styles in dress. It is made with a heavy nutria-lined coat and trousers of goat fur. When the flyer makes a landing near a city and wants to appear dressy and conventional, he just pulls off the goat-skin trousers, and is then attired in the regulation army trousers, making him look less like an eskimo.



Fur-Lined Moccasins and Mittens, the Latter with an Ingenious Slit in the Right Palm to Free the Fingers for Writing, and a Fur-Lined Helmet with Built-In Radio Head Receivers

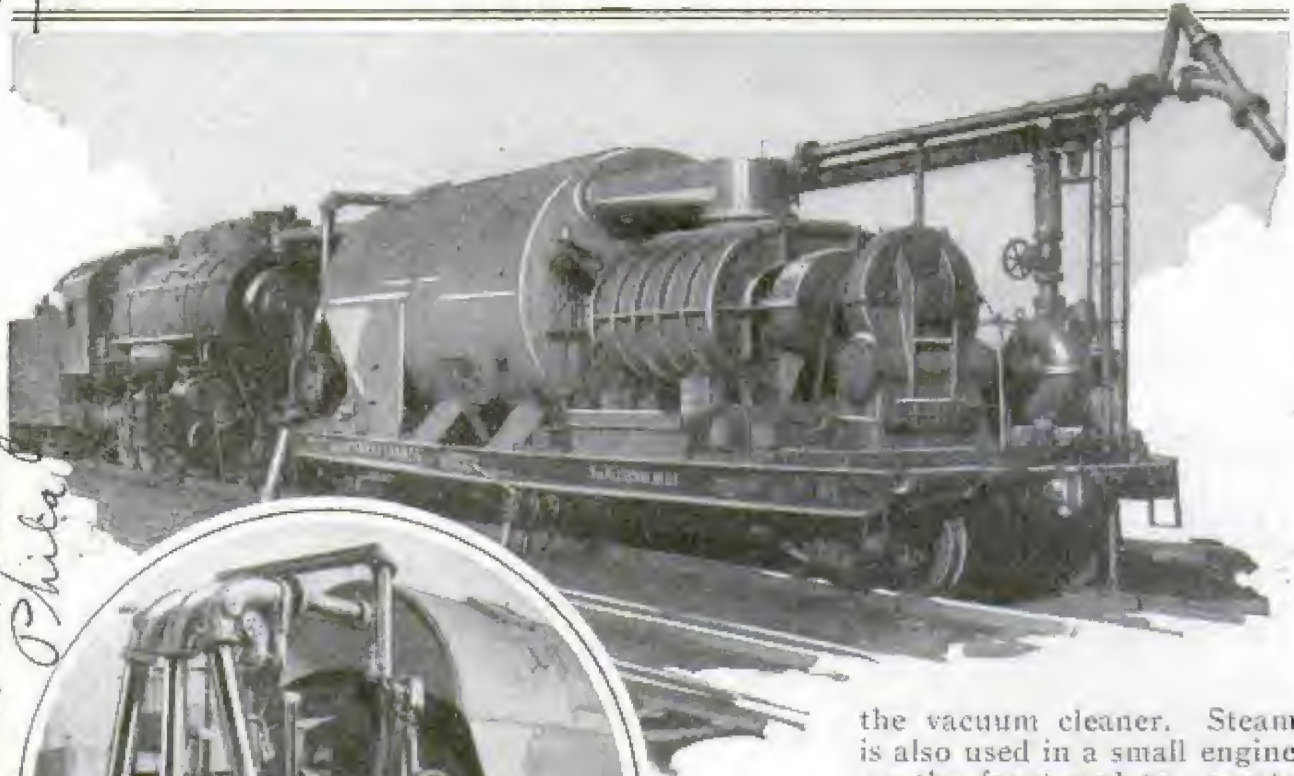


Top, Left, Lieut. John MacReady, in His High-Altitude Suit, and, at Right, with Oxygen Tube in His Mouth; Two-Piece and Non-Sinkable Suits Below



1307

Mfr. Pneumatic Conveyor Co.
Steel Bldg
Chicago



Views of the Vacuum Ballast Cleaner Showing Suction Pipes for Both Sides and Middle of Track

BALLAST CLEANED BY VACUUM TO SAVE HAND LABOR

Operated by steam from a locomotive, a huge vacuum cleaner sucks up ballast, cleans it and returns it to the track at the rate of a thirty-three-foot rail length every three minutes. Dirt and ballast are thrown against a screen within a huge tank in the apparatus by means of a partial vacuum created with a steam-driven fan. This screen is set at an angle of about fifty-five degrees, permitting the refuse to fall to the bottom of the tank. The sifted ballast falls to the forward part of the tank where it is caught in small hoppers and finally reaches the track within a few feet of the place from which it was taken. The suction pipes, of which there are three, two for the outside of the track and one for the space between the rails, have telescoping joints so that they can be raised or lowered. Steam for the operation of the equipment is furnished by an ordinary locomotive, which pushes

the vacuum cleaner. Steam is also used in a small engine on the front end to operate the valve mechanism through which the ballast is returned to the track after it has been cleaned.

EXTRA GAS TANK FOR AUTOS AIDS IN CLIMBING HILLS

1240

Motorists are provided with an extra supply of fuel in an emergency tank which may be installed under the hood of the car. It is filled automatically when gasoline is put into the main tank and is controlled by a pointer on the dash. It is designed especially for automobiles having the fuel



tank under the front seat and is intended to eliminate the necessity of backing the car up steep hills when the normal fuel supply runs low. The container holds enough fuel to run the auto five to seven miles, is securely bolted to the car frame with stout angle-iron supports and

admits the gasoline directly into the feed line when the pointer control is turned to the proper position.

Twenty-six days were required for the trip of the first steamer to cross the Atlantic ocean.

Anderson Steam Vacuum Co. 119 N. Hamilton Ave.
Chicago, Ill.

REFUGE FOR BIRDS ON MISSISSIPPI

For the protection of all kinds of wild fowl, birds and animals, a preserve is being established on both sides of the Mississippi river, beginning at Rock Island, Ill., and extending north for a distance of approximately 300 miles. This tract was chosen largely because the river valley is the main airway for migratory birds. The refuge will be limited to the bottom land that lies between the river and the bluffs, which, at places, rise to a height of 400 feet. Hunting and fishing will be permitted here under restrictions. The land is now being acquired from part of an appropriation of \$1,500,000 for the project made by congress. The new reservation—when fully developed one of the largest in the world—will be known as the Upper Mississippi River wild life and fish refuge and be under control of the U. S. biological survey.

SNOW MELTED BY HOT ROLLER TO SAVE SHOVELING

To reduce the cost of snow removal in large cities, and to do the work more rapidly, an eastern inventor has demonstrated his solution of the problem, a huge roller propelled by a motor truck and which may be heated to 2,000 degrees Fahrenheit if necessary. According to reports of a test of the roller in New York city, after a heavy storm, the outfit quickly dissolved the snow.



Melting Snow with Huge Roller Pushed by Tractor; Drum Can Be Heated to Temperature of 2,000 Degrees Fahrenheit

Wm. John B. Lodge
Peascom, N.Y.



Runner Breaking the Tape at End of Sprint a Few Yards Ahead of Speedy Whippet Which Was Gaining Steadily

RUNNER IN RACE WITH WHIPPET WINS BY ELEVEN YARDS

In a feature race between a sprinter and a whippet in California, the man won by eleven yards, but he had the advantage of a seventy-five yard handicap and the dog was gaining on him at the finish. The distance run was 200 yards with the lanes marked as in a regular contest.

FRESH-WATER SPRING IN OCEAN DISCOVERED OFF FLORIDA

Five miles off the east coast of Florida, a fresh-water spring with a flow estimated at several million gallons an hour, has been discovered by officers of the hydrographic survey. The water was found rising at considerable velocity above the surface of the sea. Small boats were pushed away by the force of the current and when a bucket was lowered, the crew had no difficulty in obtaining a day's supply of pure, fresh drinking water. The spring issues from layers of rock under the bottom of the ocean and is more than 150 feet deep, by about twelve feet in diameter, although the floor of the sea at this point is but fifty feet below the surface.

Com. Roy H. Fricke
5707 Branch Ave
Sanku, Fla.

TRAFFIC-LIGHT CONTROL BOARD REGULATES SIGNALS



Where Lights Governing Traffic of Chicago's "Loop" Are Controlled; the Main Switchboard in City Hall

One of the features of the newly installed automatic traffic-light system in Chicago's "loop" district is the central control board located in the city hall. From this unit, intervals between the signals may be changed with little difficulty, if circumstances demand the alteration. Forty-nine street intersections are governed by the system, which is not synchronized as in most installations of this kind, but so arranged that the length of the "stop" and "go" intervals is greater or less at some crossings than at others, depending upon the condition of traffic.

PLATINUM DEPOSITS IN AFRICA START NEW FORTUNE RUSH

Discovery of platinum in South Africa has attracted a rush of miners, who like the dauntless adventurers of Klondike days, have penetrated remote parts of an unsettled country, far from railroads and navigable streams, in search of the rich deposits that are believed to be contained in an area of 2,000 square miles in the Transvaal. The hazard of malaria fever adds to the dangers of the rush and machinery must be carried through the

jungles by pack. To find the metal, deep shafts must be sunk. Platinum was discovered in the district about three years ago, and richer deposits unearthed in 1924, but the finds were kept secret until the news finally leaked out. With the metal selling for about \$125 an ounce, the lure of the new fields is naturally strong.

ROCKS SEALED WITH CEMENT AID TUNNEL BUILDERS

Compressed air drills are thumping under the Mersey river in England as workmen drive shafts through the rock to connect Liverpool and Birkenhead by a vehicle tunnel which will shorten the journey between the cities and speed up traffic. Preliminary small passages are being constructed first, and as the work proceeds, holes are bored into the rock and these are filled with cement to seal the strata so that work on the main tunnel can be done without the hindrance of seepage. The finished tunnel will be a mile and seven-eighths long; the roadway, thirty-six feet wide, will accommodate four lines of vehicles, and there will be three entrances, two in Liverpool and one in Birkenhead. Spiral approaches reduce a steep ascent and, like the auto tunnel under the Hudson river in New York, the Mersey shaft will be thoroughly ventilated to carry away exhaust fumes from the motors.

BOWLS OF RUBBER FOR BULBS CAN'T BREAK OR SCRATCH



Pliant rubber bowls in classic design and various colors are now on the market for growing flowering bulbs. The advantages of their use are that they retain their shape, cannot break and will not mar the furniture. Furthermore, since they are soft and unaffected by

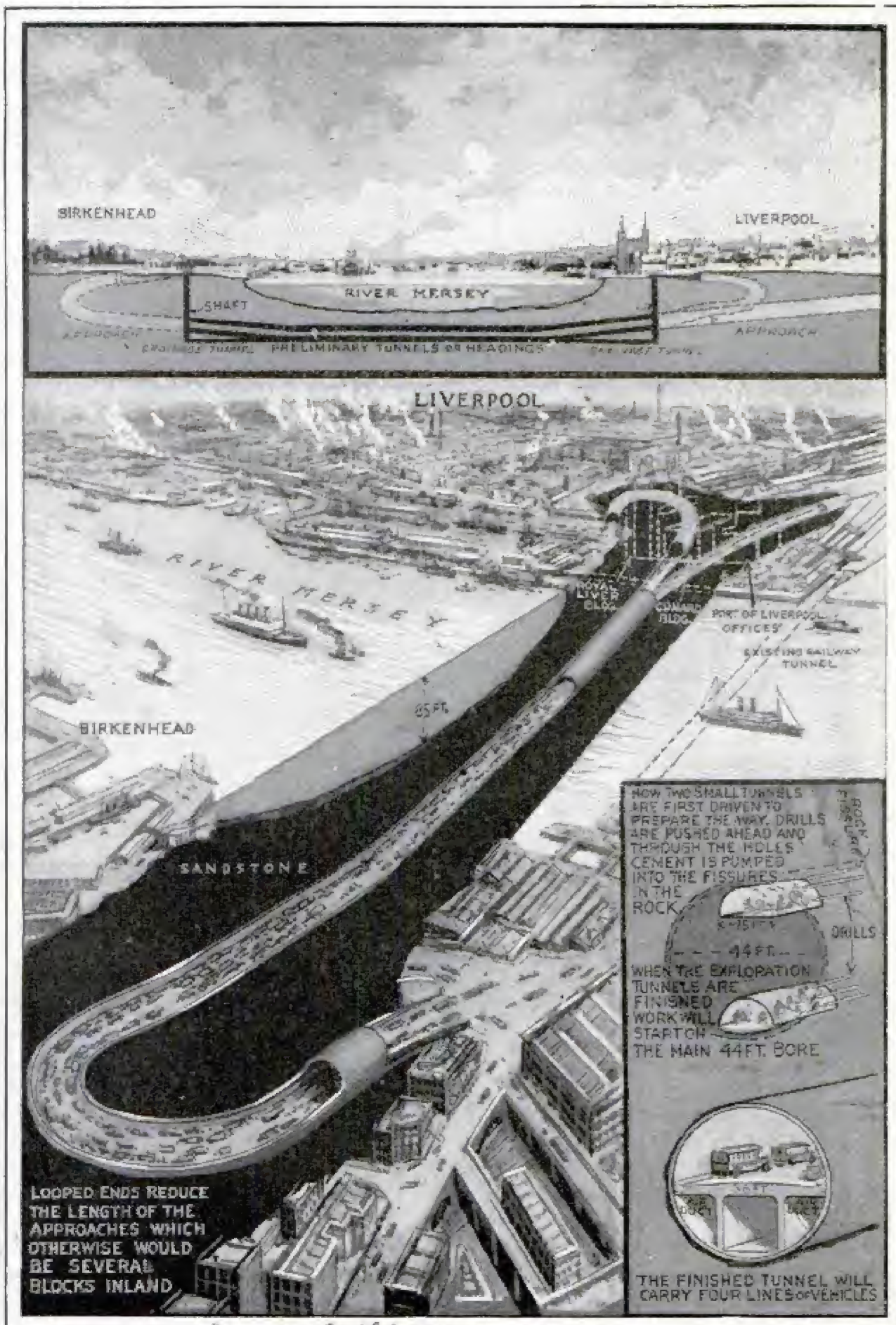
moisture, they are not likely to cause stains on any surface upon which they may be placed.

New York Times

1/31/26

The Avon India Rubber
Co. Ltd 343 Custom
Road London E.C. 4

1212



Copyright, The Graphic

Jan. 9, 1926

Cross-Section Drawing Above Shows Preliminary Tunnels in Relation to Main Passage; General View of Entire Subway in Center, and at Right, Diagrams Illustrating Method of Construction and Plan

FIDDLE WITH BEER-KEG BACK PRODUCES CLEAR TONES

1278

Strings stretched over an old beer keg as a sounding board and carefully tuned, afforded a western musician a novel fiddle

for playing old-time dance music. The instrument is

Beer-Keg Fiddle for Old-Time Dances Has Mellow Tones and Is Easily Held



said to have produced agreeable tones and was made ready for use with a few odd pieces of wood.

OIL FROM FOSSIL-FISH DEPOSITS FOUND IN TEXAS

1300

Near Burnet, Tex., teamsters used to stop their wagons occasionally and grease their axles with an oily substance that seeped from the ground. Recently, it has been discovered that this substance comes from a large deposit of prehistoric fish or marine animals, which produces, upon distillation, an oil known as ichthyol, valued as a curative agent in the treatment of various skin diseases. The deposit is from two to seven feet deep and extends over nearly 2,000 acres. It rivals the natural source discovered some years ago in Germany. That country had a monopoly on the oil,

and during the war, prices rose from \$5 to \$80 a pound. From the shale in which the substance is found may be derived a base for paint, shellac and varnish. Sodium, zinc, ammonia, silver, gold and platinum are also found, and fertilizer can be manufactured from the residue, it is said. Perfumes and a synthetic gunpowder can also be made, according to reports. Experts who have examined the valley estimate that there is enough of the deposit to last the United States 600 years.

MOVING DUMMIES FOR TAILORS REPLACE LIVE MODELS

1299

Automatic models that move their lips, eyes and heads, by means of electric motors hidden in their chests, have appeared in Paris tailors' windows. They are being used instead of the conventional wax and live figures and in a wide variety of shapes and sizes, corpulent, small, plain-featured and otherwise more closely resembling some of the actual persons for whom the costumes are intended. The faces are composed of fiber and plaster.

"NURSES" ATTEND CANARIES ON OCEAN VOYAGES

1306

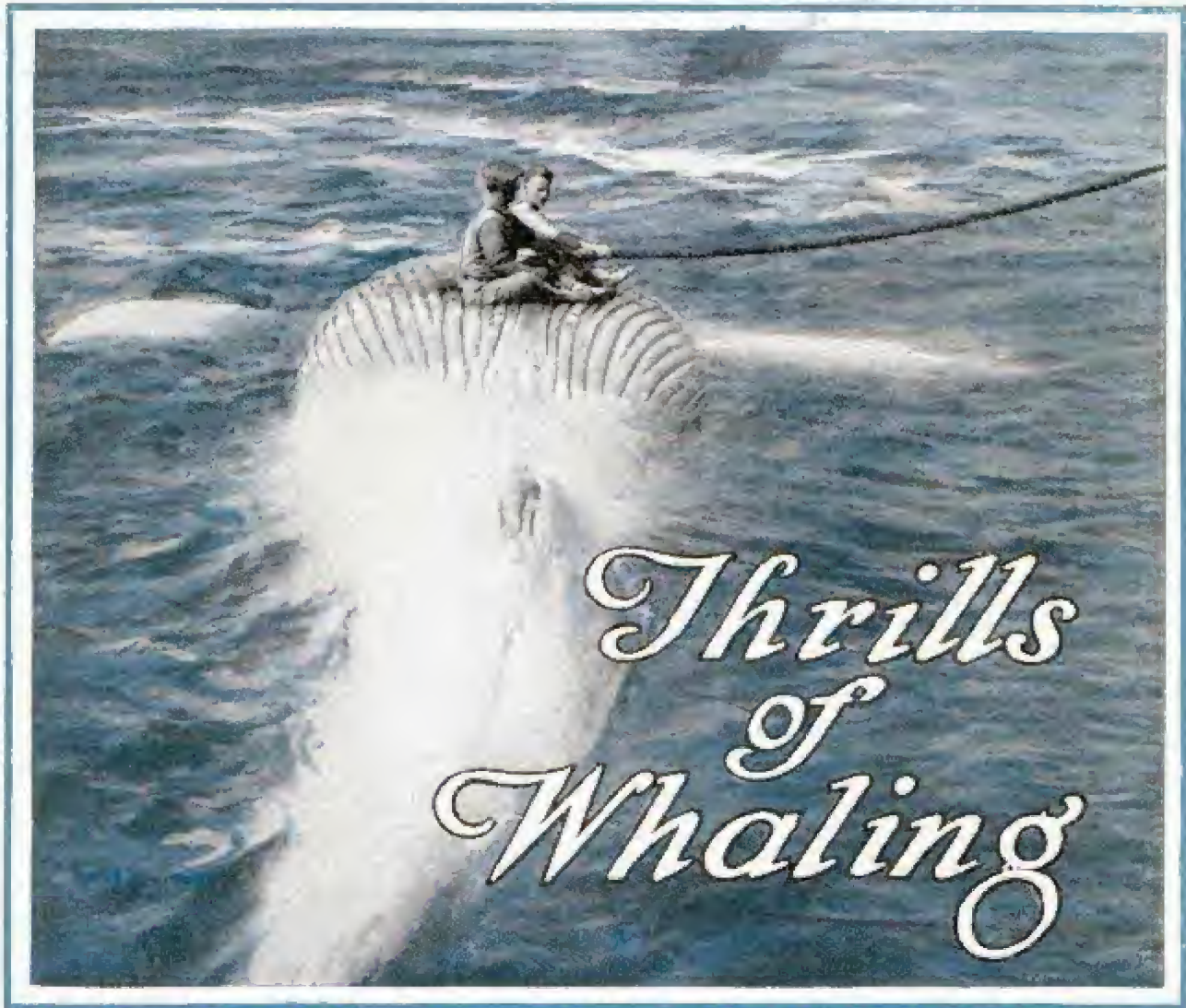
Canaries shipped into the United States from Germany and other countries are usually carefully tended by special keepers, to feed and water them on the voyage. About 2,500 canaries are allotted to one man. In one German city, from which thousands of canaries are exported annually, the workers become proficient in carrying large numbers of light wooden cages in which the birds are shipped.

Applied in Leinental



Expert Cage "Toters" Employed at German Canary Farm

White Eagle, Winnipeg Indian Hospital
Winnipeg, Neb



Whales Are Often Towed to Port, Instead of Being Cut Up at Sea, Since the Addition of Air Compressors on the Steamers Enables the Crew to Inflate the Carcass and Prevent Sinking

By FRANK B. HOWE, 3rd floor, Los Angeles Times Building, Los Angeles, Calif.

THE spectacular, thrilling and highly profitable profession of whaling, almost a lost art during recent years, has come back into existence and permanency with the discovery that the waters of the Pacific off Mexico, Lower California, and even the west coast of the United States offer an almost boundless field to whaling expeditions.

So thickly inhabited is this region that during the season just ended, a Norwegian fleet of three vessels, operating off the upper Mexican coast on an experimental basis to determine the value of these waters from a whaling viewpoint, obtained 298 whales. When it is considered that whales average in the neighborhood of eighty tons each, it is easy to realize the vast profit that can be derived from a prolific field of this sort.

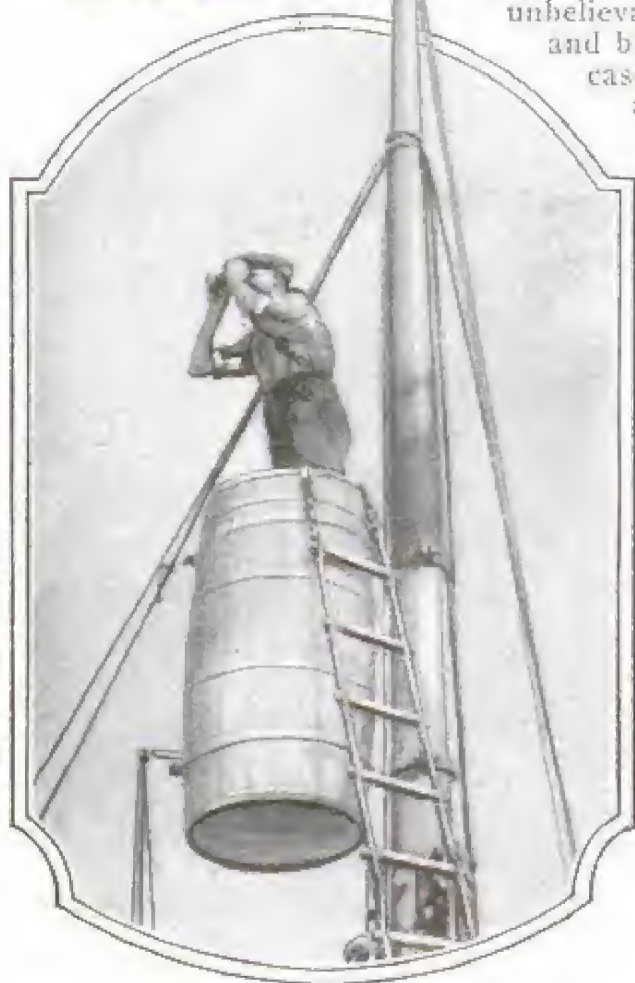
Whaling, as carried on by the Norwegian expedition, is unrivaled for sheer thrills and excitement. From the time the ships leave port for the whaling grounds

until they return, perhaps months later, there is never a dull moment. The routine of sea life as experienced on merchant ships and passenger liners is unknown to the whaler. He never knows at one moment where he will be the next; whether the day will yield fruitless search and endless cruising, or be a succession of dashes, battles and prizes. In short, if one is looking for all the romantic side of sea life, plus rapid-fire action and excitement, whaling is the ideal profession. It entails tremendous energy and plenty of hard work, but it offers returns, both physical and financial, in proportion.

The whaling fleet consists of three "killer" ships and a mother ship. The mother ship is a lubberly craft that plods along and acts as tender to the small, fast killers. When these have succeeded in capturing a whale, it is towed alongside the mother ship and the latter attends to the routine work of dissecting it, extracting the oil, and other disagreeable but

979 -

From His Barrellike Lookout Station, Known as the Crow's Nest, the Whaler Keeps Watch over the Sea for Tell-tale Waterspouts



necessary work while the killer goes back to prowl over the seas in search for more whales. Likewise the mother ship acts as supply ship to the smaller boats; furnishes

food, fuel and other necessities, and, in general, attends to the work of mothering the smaller ships and their crews. All the thrills of whaling come on the killer ships. They are small, sleek little boats, with an almost unbelievable supply of power. They are designed and built for speed and easy maneuvering, and in case of necessity, in pursuing a whale, they can almost literally be stood on end and turned

in their own length. The most distinctive feature of these boats is the harpoon gun in the bow. This resembles, to quite a degree, the old-time Civil War cannon, to be found in every park and public square. It is mounted on a revolving base, and before the killer ship starts out on its errand, it is swung inward and loaded. Loading consists in inserting the harpoon in the muzzle of the gun. The harpoon is about four feet long and the rear end is attached to a long coil of rope. When the harpoon has been inserted, the explosive head is attached. This is a hollow iron device with a sharp point. A quantity of black powder is tamped into it and the head screwed onto the harpoon. The gun is then swung around again and all is ready for the appearance of the prey. A compressed-air hose is arranged near by, for reasons which will be apparent later.

With the gun thus loaded, the ship starts out to look for a whale. High atop the mast is a barrellike device which serves as a lookout tower. A sailor is stationed in this lookout with a powerful glass. To him falls the first duty of the trip—locating a whale. As the ship cruises around in waters where the whales are likely to be found, the lookout ceaselessly sweeps the horizon with his glasses. Suddenly the historic call "there she blows" comes from his station and instantly the



Taking in the Slack after Harpooning a Whale; the Photograph Shows a Thirty-Knot Speed Boat Used by New Zealand Whalers to Run Down the Fast-Swimming Prey at Sea

979



The New and the Old, a Whaling Speed Boat in the South Atlantic, and an Ancient American Whaling Bark, Now a Museum

ship becomes a beehive of activity.

The course of the ship is directed toward the spot where the whale has been sighted. The captain or the first mate mans the gun, ready to fire when the quarry is close enough. Perhaps the chase goes on for miles, the killer maneuvering for an advantageous position as the whale dodges about. Finally, if all has gone well, the whale suddenly appears to blow directly ahead of the craft. As it rises to the surface the harpoon gun is discharged and the weapon is hurled into the gigantic animal, dragging the rope with it. There is a delay of a few moments while the whale dashes about in a frenzy and suddenly the explosive head of the harpoon goes off. Inevitably this ends

979

New York
Herald. Trib
2/5/24

the battle. By no means is the fight to capture the prey over, however, even though the quarry has been killed. Here is where the compressed-air hose comes into play. A hole is quickly made in the body of the whale and the hose inserted. Air is pumped into the leathery hide until the whale resembles a small balloon. When sufficient air has been pumped in, the whale floats on the surface and can be handled. Otherwise it would sink and all the work be in vain.

Incidentally, this procedure of pumping up the whale has been the subject of much amusement to those who have seen it done. One imaginative newspaper cartoonist pictured hydrogen gas being pumped into the mammal instead of air and had the whale floating about in the sky, much to the amazement of passing dirigibles. With the whale captured and made buoyant, it is taken in tow and brought alongside the mother ship, where the work of extracting the hundreds of gallons of oil and the valuable whalebone is carried on. The killer ship then returns to sea in search for another whale.

There is ample excitement to satisfy anyone in hunting and capturing the whale in this manner. But when all does not go smoothly, there is much more of it. For example, a miscalculation may be made and the harpoon glance off the tough hide instead of penetrating it. Then there is an angry whale to be reckoned with. Or, perhaps, the ship may be maneuvered a little too close and the whale rises below it instead of to the side. Or the explosive head may not function and the whale start for Japan or Alaska with the ship in tow. Or any one of a score of other mishaps may occur to enliven

the chase. When it is realized that the Norwegian expedition captured practically 300 whales in a period of three months, an average of more than one a day for each killer, it can readily be seen that the Pacific waters off the Mexican and California coasts offer a splendid base of operations for the whalers.

WASHINGTON'S ENGLISH HOME 125 RECONSTRUCTED HERE

Some of the stones and oak beams of Warwick priory, an old English country house, have been shipped to Richmond, Va., where it is planned to use them in reconstructing Sulgrave manor, the ancestral home of George Washington. Besides the beams and other parts, crates of leaded glass windows and as much of the carved interior of the old priory as could be removed, have also been imported. The builder plans to use the reconstructed manor as a residence, and then place it in the hands of the Virginia historical society as a museum.

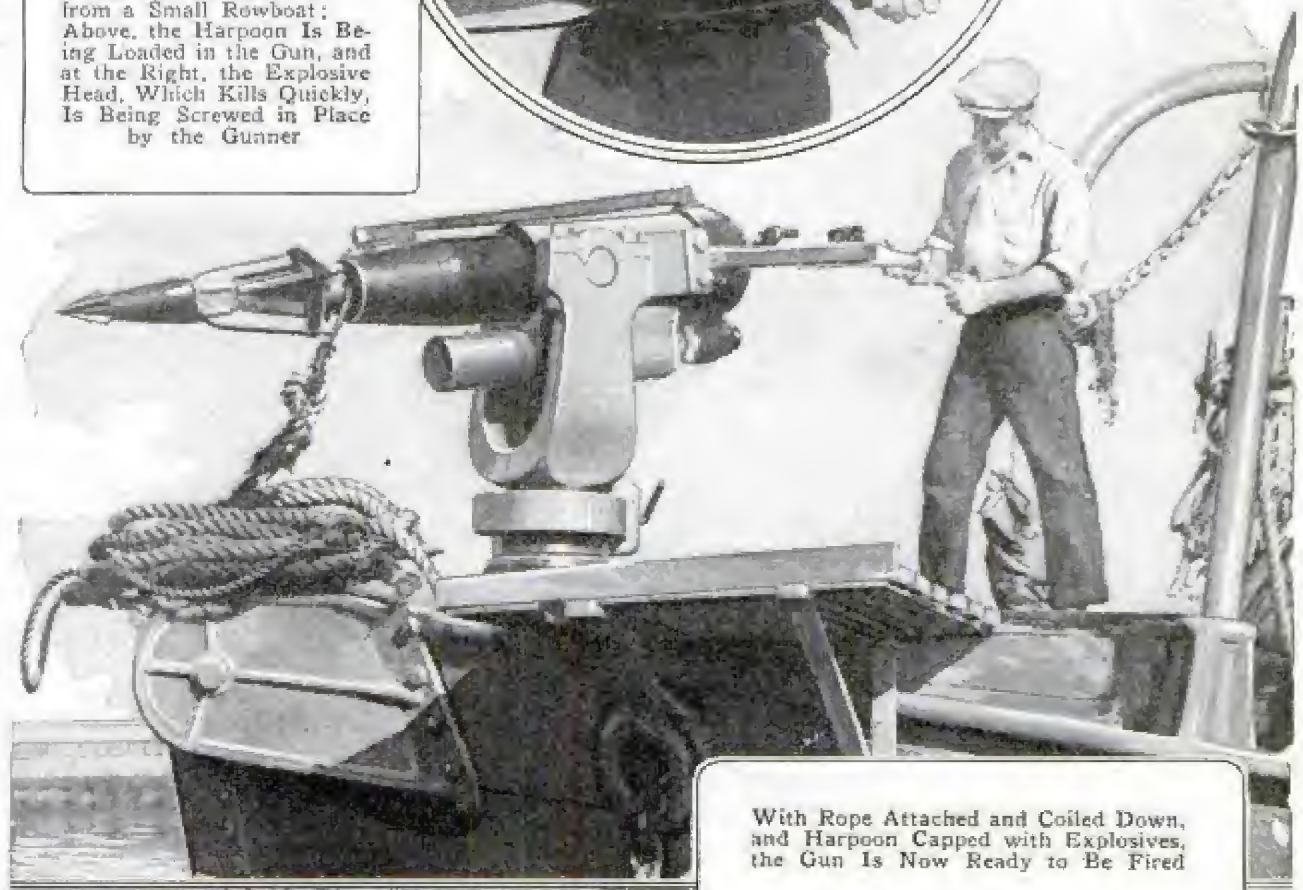


The Latest Thing in Steam Whaling Ships, with Powerful Gun in the Bow and Lookout Station High on the Mast; This Speedy Ship Pursues and Kills the Whales, But Does Not Do the Cutting; Above Is the Gunner Waiting for the Whale to Appear





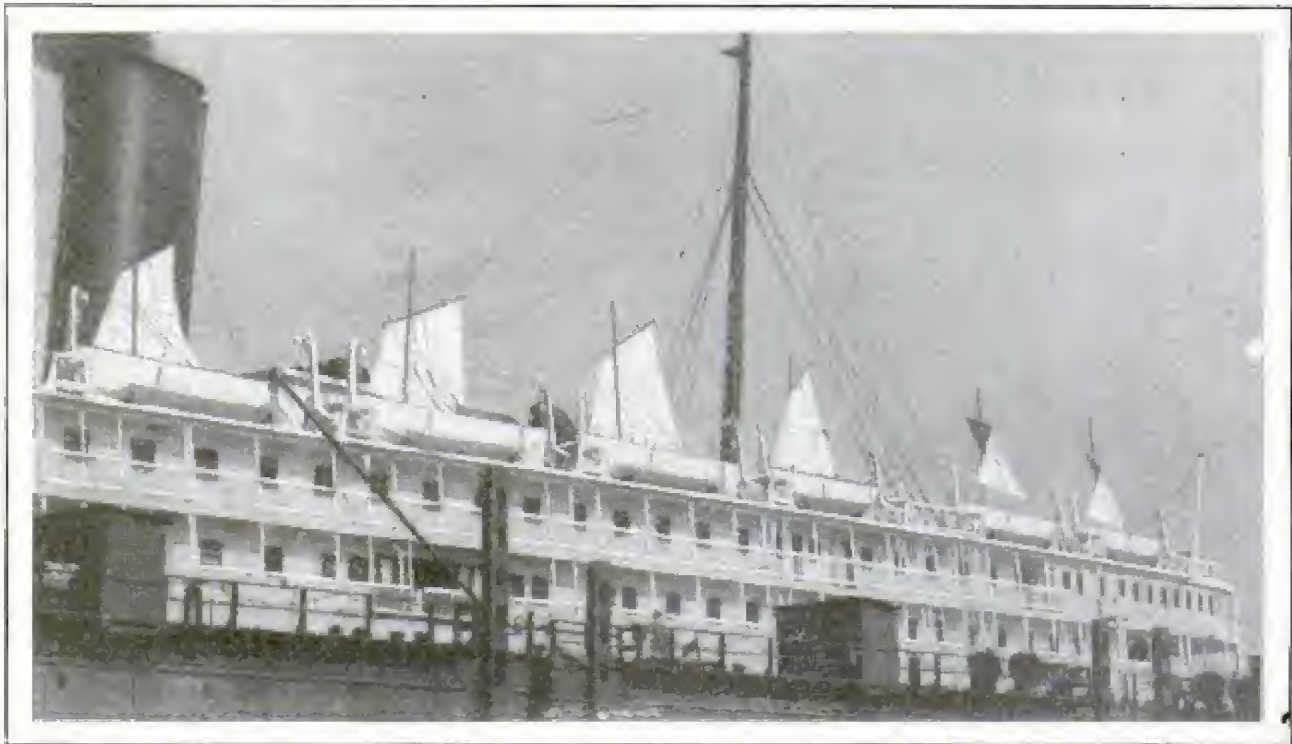
A Modern Whaling Harpoon Is Shot from a Gun Mounted on a Big Boat, Instead of Being Thrown by Hand from a Small Rowboat: Above, the Harpoon Is Being Loaded in the Gun, and at the Right, the Explosive Head, Which Kills Quickly, Is Being Screwed in Place by the Gunner



With Rope Attached and Coiled Down, and Harpoon Capped with Explosives, the Gun Is Now Ready to Be Fired

1252

GAS TO REPLACE SAILS FOR LIFEBOATS ON LINERS



Where Wind Is Making Its Last Stand as an Ally to Navigation; Pacific Liner "Harvard" and Its Fleet of Sailing Lifeboats; Rigging Is Simple to Facilitate Handling in Emergencies

Sailing lifeboats on seagoing liners, the last bulwark of wind power in the passenger-carrying trade, is now being threatened by the gasoline motorboat. The British government requires all big English

liners to carry a certain number of power boats, equipped with wireless, to tow the other lifeboats in case of shipwreck, so it may not be long before sails disappear forever from passenger ships.

VACUUM CLEANER FOR FURNACE SAVES TIME AND WORK

Operated on the same principle as the apparatus for cleaning rugs and floors, a vacuum outfit to rid the furnace of soot is carried from house to house on a small automobile truck and has extension suction pipes to make connections from the street. A huge bag collects the dirt.



Vacuum Furnace-Cleaner Outfit; Big Dust Bag at Rear with Section of Pipe Connection to House in Center

LENGTH OF NATIONAL AIR HELD TO SHOW SIZE OF COUNTRY

That there is a curious relation between the length of the national tunes and the size of the countries they honor, is the observation of an English musical expert. Only fourteen bars of music make up "God Save the King," yet the British empire is enormously vast. The old Russian

national hymn contained but sixteen bars, whereas the national anthems of smaller countries are much longer, the Siamese song, for instance, having sixty-six bars and that of Uruguay, seventy bars. "Hail Columbia" contains twenty-eight bars and one of the longest hymns in the world is that of the tiny republic of San Marino. China, apparently is an exception, as no less than half a day is required to sing its national anthem.

*High field view
Chester field. mo.
W. Holden, Reg.
New Road.
Apr 1905*

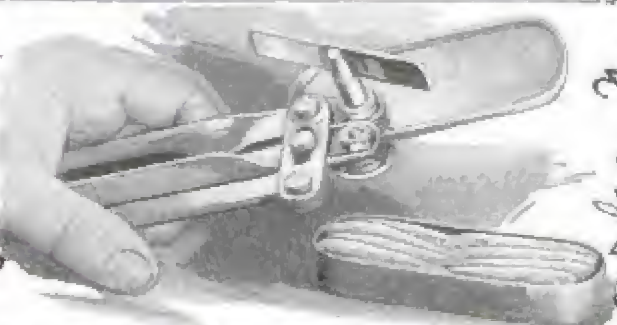
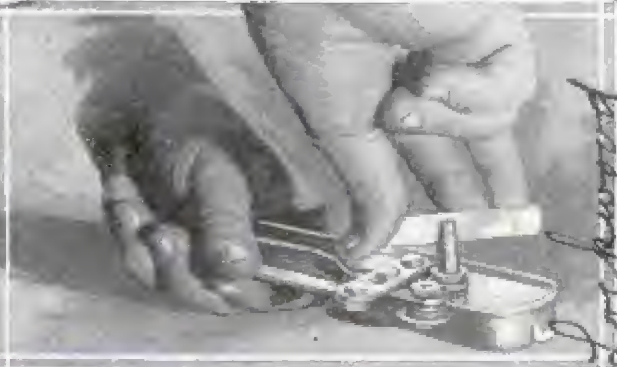
*1286
Dolland & Furnace Co
1 Dollands, Mich.*

**FRESH TIMBER CURED IN DAY
BY VACUUM PROCESS** 11 68

Fresh-cut lumber can be seasoned sufficiently for the carpenter's bench within a day or less by a high-vacuum process a Swedish engineer has discovered, according to reports from Stockholm. Green birch boards are made ready for constructing furniture in twenty hours, spruce and pine in thirty and oak in forty. The lumber thus cured is said to be free from cracks, warps and "blue" spots. Planks are placed on rollers and slid into air-tight chambers where they are first heated by steam from coils and then pumped dry by vacuum. The procedure is repeated according to the nature of the wood.

**CAN OPENER WITH TURNING KEY
CUTS TOPS OF ANY SHAPE**

Adapted to angular as well as round tops, a can opener now on the market is intended to reduce the work and danger of cutting the tins. It has a sharp-edged and a ratchet wheel between which the rim of the can is clamped by means of a lever. By turning a broad key at the top, the ratchet easily turns the can while the opener is held stationary. This simplifies opening the corners on rectangular or round containers and makes it practically impossible for the hands to slip off. Safe-



Adjusting Opener to Can, and Lid Removed; Container Is Turned against Cutter with Key



Replica of Washington Monument in White-Silk Roses

**MODEL OF MONUMENT IN ROSES
AS HONOR TO WASHINGTON**

Containing 25,000 white-silk roses, a model of the Washington monument has been constructed by a New York man who proposes to have it autographed by persons attending patriotic gatherings and then presenting it to Mrs. Coolidge. On the inside and base of the model are seven large electric lights to illuminate the figure. Nearly three weeks were required to complete the work.

**OPALS HARDENED BY FANNING
TO SIMPLIFY CUTTING** 130 4

Using an ordinary electric fan, an English gem expert has found a way to harden opals in a current of air so that they can be cut more easily, it is reported. The hardening is said to so toughen the stones that damage is less likely to occur when cutting and shaping them, and they retain their polish longer. This process also shortens the seasoning period that formerly was necessary to allow the stones to harden naturally.

C. W. Jewell Eng Co. St. Louis, Mo.

Charles R. Lockwood, Rochester, N. Y.

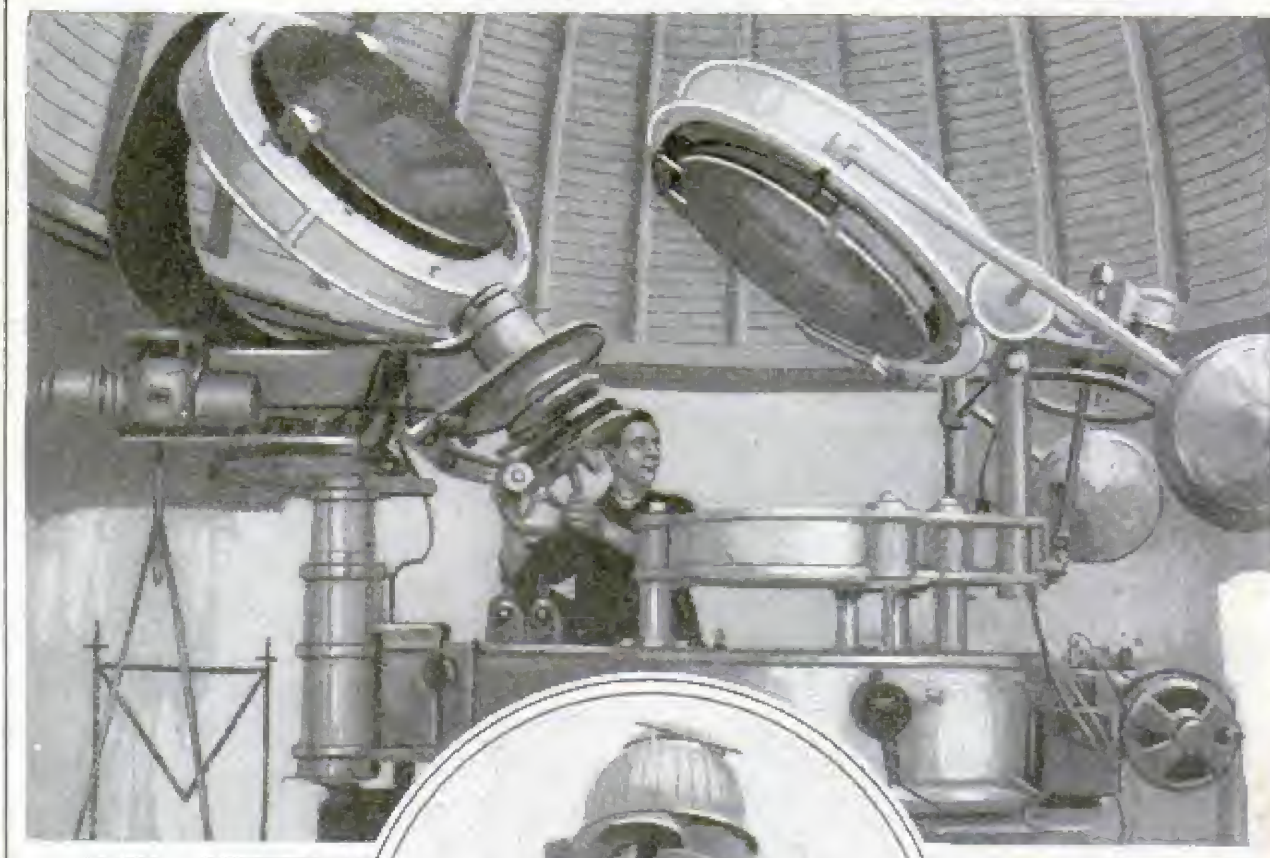
Frank H. Ellison, New York.

612 N. Michigan Ave. is further assured by the smooth, flat edge left by the cutter.
 Druggist - Charles R. Lockwood, Rochester, N. Y.
 Cont. Sec. R. Holden, Wash. D. C.
 Jap. Sec. Jap. Sec. Jap. Sec.

1268
794

1/28/26

POPULAR MECHANICS



Views of the Tower Erected at Potsdam for Photographing Light from the Stars Especially for the Purpose of Further Investigating Einstein's Theory of Relativity; the Tower Itself, with Curious Porches and Windows, Is Like a Huge Telescope. But Only the Cupola Part and the Huge Mirrors Move; the Dome Opens and Turns as Usual



Above Are the Mirrors upon Which the Light from the Stars Falls; They Are So Adjusted That They Reflect the Beams Down to the Basement of the Tower through the Vertical Light Shaft up Which You Are Looking in the View Below; the Framework Is of Steel, the White Square Is a Reflector, and the Dark Area Part of the Inside of the Dome

Courtesy The Spherometer



At Left Is the Tunnel Where Light, Reflected from Stars down the Vertical Shaft, Is Finally Photographed for Analysis; the Passage Is Fifty Feet Long and Is Insulated, to Prevent Temperature Variations, with Double Walls between Which a Man Can Walk

*Village Deep Mine
Johannesburg*

GOLD MINE OVER MILE DEEP —COOLED BY ICE WATER

When workers in a gold *317* mine 7,200 feet below the surface in South Africa became seriously affected by the high temperatures, efforts were made to cool the air by placing blocks of ice at various parts of the workings. It was found that this expedient lowered the temperature only one degree. The ice was then melted, the cold water being sprayed into the mine through the ventilating system. This met with far better results and an appreciable lowering of the temperature, which had varied from eighty-four to ninety degrees, followed. The problem was not wholly solved by this plan, however, as the moist air with the heat, was more likely to cause apoplexy, while the dry heat alone was productive of other diseases.

The experiments therefore are being continued in order to correct these drawbacks.

1284

OLD RAILS AS CROSSING PLANKS REDUCE REPAIRS AND BUMPS

Instead of discarding its steel rails after they have served their time on the roadbeds, a middle western railroad is utilizing some of them for road crossings. They are cut to appropriate lengths and the ends bent down to an angle of about forty-five degrees. They are then placed on the crossing with the curved ends to the ground and are spiked to timbers. Spaces between the rails are filled with a mixture of tar and finely crushed rock. A smooth surface is the result, loose boards that may fly up and damage autos and cause accidents are avoided and repairs reduced.



at Adrian, Mich.

*Lectro, Toledo + Dayton O.R.
Marshall*



Recalling Past Glories of the Seas; Model of Five-Masted Full-Rigged Ship Exhibited at Motorboat Show in New York

MODEL OF FIVE-MASTED SHIP TOOK THREE YEARS TO BUILD

Visitors at a motorboat show in New York city caught a glimpse of the days of spars and canvas in a ten-foot model of a five-masted full-rigged ship. It was seven feet high, had a beam of thirteen inches and was ten inches deep in the hold. The

hull was not fashioned from a solid block, but was planked and ribbed like a real boat. Sails were formed from vertical strips of tape sewed in the same way that actual sails are made. Sheaves of the blocks turned when the yards were braced and nearly every other detail was true to life and carefully constructed to scale. The amateur who built the model spent about three years in making it.


*Built by Thomas Rosenberget
Cochran's Beach, New York*

1320 796

*Chas. J. Mc Mahon. Esq.
c/o H. Logan. Esq. Ltd
Rich and Coy. Ltd
Wharf St. Brisbane, Queensland
Australia*

POPULAR MECHANICS

Railroading in the Wilds



Thrills and Adventures with Big Game on the Night Mail Trains in the Tropics

By HAROLD T. WILKINS

IT is a cold night in the wild bush country of India where the great transcontinental railroad runs through heavy jungle. In the cab of the locomotive, the engineer is trying to make up time to catch the mail boat due to leave for Europe on the following day from a port 800 miles down the line.

The native fireman reaches for a shovel, when he sees, on the roof of the car coupled to the engine tender, two eyes and the form of a Bengal tiger. The fireman is paralyzed with fear, but the engineer senses the danger and looks around. Quick action is imperative, and as he slows the train down to a stop, he jerks open the firebox door, and a sudden blaze of light illuminates the dim interior of the cab. The whistle screams, and the astonished tiger leaps from the car and speeds across the track into the black night of the jungle. Probably, as the night mail stopped to take in water at a wayside tank near the bush country, the animal had bounded on the car in search of food.

Tigers, however, though formidable opponents to encounter at night on the footplate of a racing express, are not the most dreaded enemy of the engineer on a tropical road. On some lines wood fuel is used. One night, the fireman of a mail

train, running from Bombay to Madras, was heaving logs into the furnace, when a cobra uncoiled itself from a billet of wood and reared up into a hooded crest. The reptile had been aroused from its torpor, due to the cold night air of the tropics, by the warmth of the fire radiated from the open door of the firebox.

High up on the "roof of the world"—the Himalayas—a picturesque railroad, often doubling back on itself, climbs to the cool hill stations from the burning plains of northern India. As soon as his engine is in the dense jungle, the engineer stops and lights a flare on the roof of his cab. He does this to scare away big game from the railroad track.

One Indian train was wrecked by a collision with insects. It ran into a crowd of millions of locusts. The engineer applied his brakes, but the insects had so greased the rails that the train crashed into a dead end. On the French military railroads in Algeria and Morocco, these locusts, at certain times of the year, darken the sky and cover the ground to a depth of three inches. Only very slowly can the locomotive grind its way through the mass.

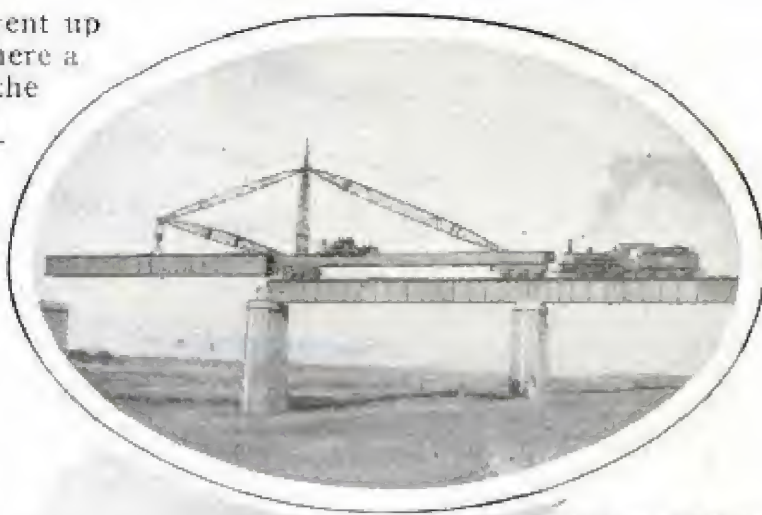
On a railroad in Rajputana, northern India, the train to Delhi was crossing a sandy desert, when the brakes ground the

wheels. Everybody got out and went up the line to the head of the train, where a sacred cow or white zebu, lost in the desert, had strayed onto the line. The oil-stained, turbaned Hindu engineer bent down and gently pulled the cow's horns and tail to persuade her to rise. Not for untold wealth will the Hindu engineer run down a holy cow.

Near where the Victoria falls—a wall of waters 400 feet high—foam over the mile-wide gorge of the Zambesi river, in South Africa, is a splendid big-game reservation. Along this section of the Rhodesian railway giraffes are frequently seen from the trains, and elephants and zebras are not uncommon.

The line runs through a wild country of jungle and bush, in which the wild pig, the eland, the wildebeest, the dangerous sable antelope, deer, and, last but not least, man-eating lions abound. One day, not long ago, a passenger train, at a turn of the track, ran into and was derailed by a herd of thirty-six wild elephants.

Lions swarm in Rhodesia. On dark



Bridge Building in India, Where a Derrick Flat Car Handles Complete Girders; Center, Building a Temporary Wooden Pile Bridge, and, Bottom, Unloading a Locomotive from a Railway Car in India



moonless nights they swoop down on some native cattle stockade. All of them stand outside the six-foot palings and roar in unison. The women shriek in fear, the men blow trumpets and yell, and the cattle stampede. This explains the alarm of a

South African station-master who recently sent two frantic telegrams down the line in quick succession from an upcountry depot on the lonely veldt. "Please send further police protection. Men very brave, but less so when lions begin roaring." Then, "Please let 10:00 a.m. run up the platform, disregarding signals. Signalman up post. Lion at bottom."

A loud whistle announced the arrival of the passenger train from Bulawayo. Looking cautiously out of an aperture on the side of the cab, the engineer saw a full-grown lion stalking an unfortunate man, clinging to the top of a signal post. The terrified station officials had barricaded themselves in the railroad buildings. The engineer gave a little turn to a switch in the cab, and such a roaring, hissing cloud of steam burst from the engine's valves and cylinders, accompanied by a series of blasts on the whistle, that the lion fled. A much worse fate met an ostrich which



one day charged an express train in South Africa. The kick of this big bird is worse than that of a mule, and it can even fatally injure a man. The ostrich got on the track and ran down the line between the rails, head on toward a South African mail train making up for lost time on the way to Cape Town. It disregarded the warning whistle, charged the locomotive, hit the cowcatcher and was killed.

The Field museum of Chicago recently obtained from Lieut. Col. J. H. Patterson, an English civil engineer, the skins of two of the most famous lions in the world, who, between them, tied up construction on the Uganda railroad for three weeks and interfered with it seriously for several months, before both were finally killed by Patterson. During that time the two lions killed twenty-eight Indian laborers on the road, in addition to several score African natives in villages of the neighborhood.

The depredations of this pair are without a parallel in the stories of railroad building in the wilds. Appearing at Tsavo, 132 miles from the coast, the pair for nine months spread terror among the railroad builders, most of them coolies imported from India. They invaded the tents at night, despite strong fences of almost impassable thorn bushes, and seized and carried off the sleeping men almost at will. Two or three times a week, for months, the scattered camps were visited, first here

and then there, until finally the entire working force was driven to sleeping in trees, on platforms atop water tanks, or on special scaffolding erected for the purpose. The reign of terror got so bad in December, 1898, that practically all the workmen seized a train and left for the coast, not returning until both lions had been stalked and killed.

Starting with two Hindus, seized in their tent one night, the pair began a regular round of the camps. Armed European officials camped in trees and on specially built platforms night after night, but with uncanny precision the lions for months picked out one of the few unguarded spots and made their raids.

In the early days of the raids, the workmen were scattered in tent camps along eight miles of the right of way, some grading the roadbed, others laying ties, and the rear guard placing the rails, so the lion pair had an extended field in which to work. They were not always successful in their raids. On one occasion, a lion broke into a tent occupied by a Greek contractor and by mistake seized and carried off the mattress on which the man was lying, but left the occupant of the tent quite unharmed. At another time, one of the animals jumped on top of a big tent in which fourteen coolies were sleeping, broke through the canvas, and landed on one of the sleepers, clawing his shoulder badly, but instead of seizing one of the



Big Bull Elephant, Leader of a Herd of Thirty-Five, Which Tried to Cross an African Railway Just as the Train Arrived; the Locomotive Was Derailed and Badly Wrecked, Too



Construction Work on a New Tunnel of the Southern Pacific in the Sierra Nevada Mountains, Where Snow and Intense Cold Furnished Natural Obstacles to the Work

fourteen humans, grabbed a bag of rice in its mouth and trotted off with it.

As the attacks continued, the lions grew bolder and bolder, until finally nothing flurried or excited them and they took time to pick their victims with care. Shouts, shots and waving firebrands failed to stop them then. During the early months of the reign of terror, while the railhead camp with more than 3,000 men remained at Tsavo, the workmen accepted the attacks two or three times a night philosophically, apparently feeling that with so many victims to choose from, they had a sporting chance of being overlooked. When the railhead finally moved on, leaving only a few hundred men to build a bridge over the Tsavo river and do the final ballasting of the road, the situation became more serious, eventually resulting in the stampede of the workers on a confiscated train and total cessation of road building.

The men were concentrated in a few small camps strongly guarded by thick and high thorn fences, with bright fires and armed guards on watch inside the inclosures, but despite all these precautions the pair of man-eaters succeeded two or three times a week in breaking through or jumping over the obstructions, selecting a victim and making off with him under the eyes of the frightened natives.

As the lions grew bolder they took to

stalking men along the right of way in broad daylight. One coolie trackwalker saw one of the beasts coming, and succeeded in climbing a tree, where he remained under guard of the beast until an official caught sight of him from a passing train and stopped to effect a rescue. The same afternoon one or the other of the lions was seen in three different places, one, just at dusk, stalking the doctor of the camp hospital.

Col. Patterson and the doctor decided to try stalking the lion by spending the night in a freight car parked near a recently deserted camp. The car had a door built in two parts, and they closed the lower half, leaving the top section open so they could watch and shoot if the lion appeared. The plan was nearly fatal, for instead of their stalking the lion, it stalked them and was in midspring for the open door when both saw it and fired, failing to wound, but causing it to swerve and make off.

A trap built in two parts was tried, the inner cage, separated from the outer by railroad rails, being baited with a number of workmen who slept there nightly. One of the lions actually invaded the trap and was caught, but the terrified workmen, firing through the bars, only succeeded in shooting off part of the door, allowing the animal to escape.

Col. Patterson finally succeeded in shooting one, from a perch in a tree, and

not long after bagged the other in the same way.

Considerable damage is caused to railroads near the equator in central Africa and South America, when troops of monkeys swoop down from trees over trains passing through forests to the coast and plunder cars loaded with fruit and nuts.

In another out-of-the-way part of the world, the vast forests of the Malay peninsula shelter roaming herds of wild elephants and other fierce and powerful animals, providing plenty of excitement and thrills in the life of the railroad men. A passenger train collided with a wild elephant in the Malay jungle and the locomotive was thrown from the rails. A few months ago, a herd of rogue elephants attacked a lonely railroad depot in the Federated Malay states, tearing up the rails with their tusks. A month later, at night, the wild elephants broke into a passenger depot, smashed the walls and damaged office fittings and furniture. Then a big tiger, bound for Singapore and the New York zoo, escaped from its cage on the railroad, and calmly walked into the compound of a hotel. People who were playing billiards made a quick exit, and the tiger sought refuge under a table where it was killed by a sportsman.

The volcanic island of Java holds some thrills and shocks for railroadmen working its 600 miles of lines. Here no trains run at night, because the Dutch, who con-

trol the island, cannot or will not trust the native engineers and operators. One recent summer morning, a train, in crossing a high bridge, crashed into a herd of wild water buffaloes—fierce and powerful beasts. The locomotive toppled over into the river, carrying away portions of the steel girders in its fall, and killing twenty-five people.

An epidemic of accidents at this place followed. Three weeks later, near the same bridge, a wild buffalo charged into a passenger train, derailed the locomotive, killed the engineer and injured the fireman. Another passenger train, a few days later, was pulled up only just in time to avoid smashing into four of the animals.

Monkeys, which have often figured in incidents on tropical railroads, are trapped and caught in the Philippines in a curious way. The animal will swing down by its tail from a tree onto a moving freight car loaded with coconuts. The brakeman takes advantage of its greed and indolence by cutting a small opening in the shell of a coconut just large enough to admit the monkey's long, thin hand. He puts this shell in the car, and when the plundering monkey comes on the scene, it goes its paw to clutch the delicate meat. But its hand is now wider than when it entered the nut, and finding it will not come out, the animal chatters and scolds, but never thinks of loosening its clutch on the coconut meat, and so is easily captured.



Building the First Railroad in the South Pacific, a Mine Line Running to Laloki Copper Mines, Papua, British New Guinea: Owing to the Climate, Native Labor Had to Be Trained

1246 Russell Pargach... San Diego, Calif

POPULAR MECHANICS

801

1202 Kettner Blvd
W. Ch... dealer



W. Ch... dealer



Inspecting New Parachute at Naval Station; Although Cords Are Twisted, It Opens Readily and Little Skill Is Required in Folding It; at Right, Demonstration Descent from Low Altitude

NEW PARACHUTE WITH VALVES OPENS IN SHORT FALLS

With a series of valves placed along its entire wall to facilitate opening, an improved type of parachute tested by the navy, promises to decrease the peril of descents, as it is said to permit successful use in falls of 100 feet and less. No skill is needed in folding and packing it, reports state, and no danger to the airman results if the cords should become twisted at the time of the drop.

TEA "TICKLED" IN CHINA TO IMPROVE ITS FLAVOR

"Tickling" tea as practiced by the Chinese, not only brings out the flavor but prevents wasting the leaf, according to an English expert. It appears that tea contains an active poison in the form of an essential oil, and so the Chinese do not use the tea until they are sure it is at least a year old. When ready for consumption, a

quantity of the leaves is spread upon paper and run through the hands for ten minutes, or so; then put aside in the sun. This treatment causes the leaves to uncurl and admit air and thus create an outlet for the poisonous gases, while later the heat of the sun recurls them in fifteen minutes.

LOUD SPEAKER FOR TELEPHONE ADDS TO INSTRUMENT'S USE

By attaching a special loud speaker to the telephone receiver, conversations can be heard across a fair-sized room, it is said, and the person listening has both hands free for writing or other work. No alterations in the telephone are necessary. The speaker is fixed to the phone with a setscrew and the receiver hook is controlled by a lever which can be locked so as to hold it raised while the conversation is going on. Should the conversation be of a confidential nature, the receiver can be used in the regular way after the speaker has been removed.



Using Loud Speaker Attached to Telephone Receiver Leaves Both Hands Free for Work

Com. George H. Holden Esq
Highfield Drive, Aptos, Calif
1254

1245
Bartone Mfg Co
5122 W. 22nd Place
Cicero, Ill.



Upper Picture Shows Plugs in Place and Cross Section; Below, Driving and Tops Sawed Off

EXPANSION PLUG FOR BUILDING AIDS IN FASTENING TRIM

Wooden plugs that expand and hold fast when they are driven into tile, brick, concrete, metal lath and similar materials, have been devised by a western inventor, to afford a suitable base for fastening chair rails, molding and other trimmings to walls. It is only necessary to bore holes where the plugs are wanted and drive them in, saving the labor of removing plaster or other surfacing and attaching wooden strips. The fasteners are of poplar, bind firmly to the sides of the hole and when the end is sawed off, a convenient space for nailing is left.

PLAN AUTO-AND-TRAIN TUNNEL THIRTY-TWO MILES LONG

Preliminary surveys for the construction of a tunnel thirty-two miles long under the Cascade mountains have been undertaken by the state of Washington. The bore is to be built for both trains and automobiles and will carry water from the western to the eastern slope of

the Rocky mountains for the purposes of irrigation. The project was conceived by the late H. M. Chittenden, who was also the originator of the idea of linking Lake Union and Lake Washington with Puget sound by canals. When completed, the tunnel will be more than twice as long as the Simplon tunnel through the Alps.

TAILLESS SPECIES OF SHEEP SOUGHT BY BREEDER

By crossing domestic with a variety of Siberian sheep, Prof. J. W. Wilson, director of the South Dakota agricultural experiment station, hopes to produce a tailless species. After several years of careful selection and breeding, a ram was born without a tail, and of twenty-one of its offspring, eighteen are practically tailless. Prof. Wilson says that the tails may come back in the next generation and is unwilling to call his experiment complete, but believes that the production of a permanent tailless species is possible.

RADIO SET ON BICYCLE PERMITS RIDING TO MUSIC

While riding his bicycle, an eastern enthusiast enjoys musical programs from a radio set which he has attached to the handlebars and front part of the frame. The loop, batteries and other parts are securely connected, to prevent damage from vibration, and do not interfere with the rider who can tune the set while in motion.



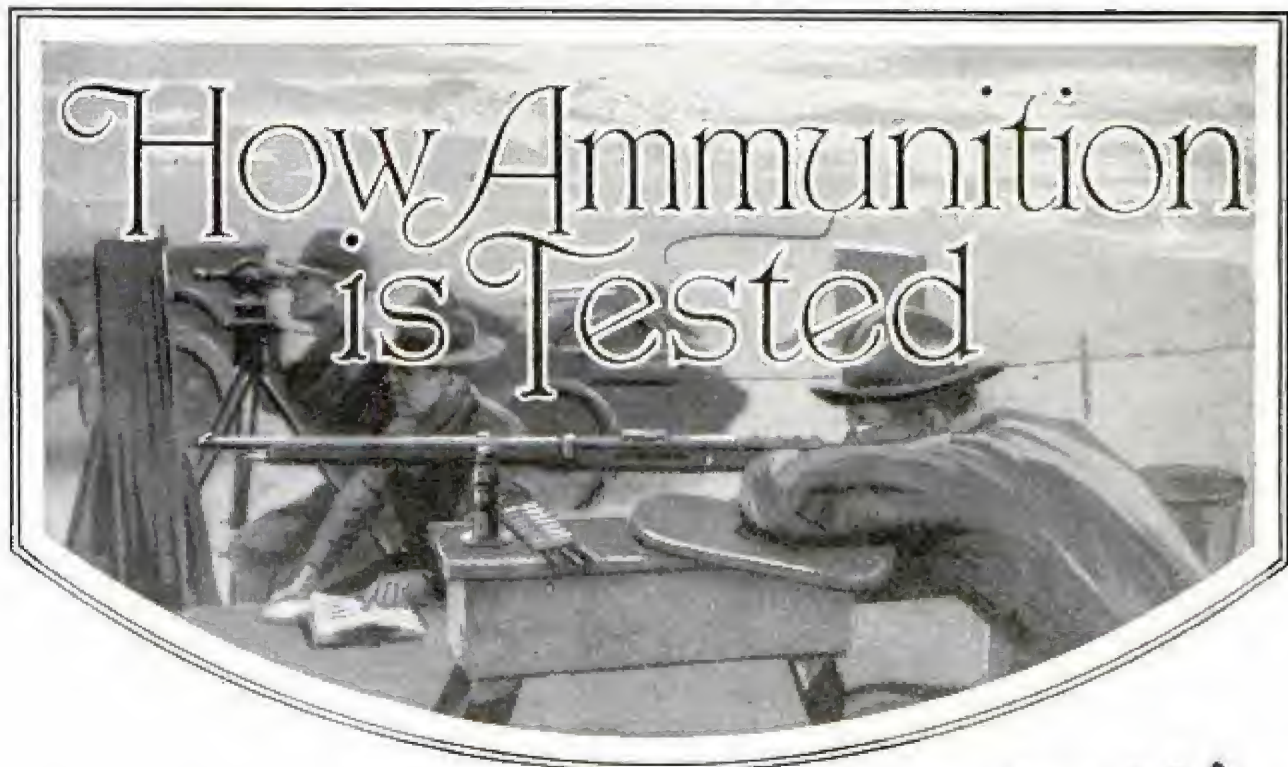
Bicycle Radio Can Be Tuned While Riding

Allyson S. Masoth, Schenectady

E. H. Norton, 1111 N. La Salle St Chicago

1234

Harley News 2/3/26



By CAPT. EDWARD G. CROSSMAN

Ante l. West Los Angeles Calif
Box 878

THE flintlock with which two of our wars were fought was as likely to miss as to hit a man at a hundred yards. Since then the improvement in arms and ammunition has been so great that in the last government test at the Aberdeen proving ground, ten consecutive shots were put into a space hardly larger than a tea cup at a range of 328 yards. Taper-tail bullets, which add practically a mile to the extreme range of the missile, were used. They proved not only to add enormously to the efficiency of the small arms, but to give higher accuracy as well.

No rifleman, even if equipped with the finest of rifles and a telescope sight, could aim and fire the rifle with so little error as this, for hundreds of shots. Machinery has to be called in, and it must be apparatus accurate to one-thousandth of an inch or less to afford such results.

The old method of testing ammunition was to clamp the rifle in what is known as a "machine rest," which was a heavy steel bed resting on a concrete base, with clamps to hold the rifle at the butt, the frame and the muzzle to the heavy sliding base. It was not a satisfactory method because clamping down the service rifle of ordinary weight would sometimes distort the barrel, and many a test was lost by some company because the rifle used was improperly clamped in the rest.

In these days a special, heavy barrel is used, twenty-four inches long and one and one-quarter inches in diameter. Two

heavy steel rings are placed on the barrel so that, regardless of how it is revolved, it will not change the line of the bore.

A V-shaped groove is milled in a heavy block of steel, its sides cut accurately and parallel, and permitting the two rings around the heavy barrel to fit down into this cut. Fine screws move the heavy V-block up and down or sideways.

The importance of absolute uniformity is shown by the fact that an error of one-thousandth inch at the muzzle would move the next shot two inches at 1,000 yards, and the comparatively small error of one-hundredth inch would move the bullet twenty inches.

Until improvements were made this year, the barrel with a short bit of stock attached, was merely laid in this V-cut in the steel block, a cartridge loaded into the breech and then the trigger was carefully squeezed to avoid moving the barrel. It slid back under the recoil, and the firer caught it with the palm of his left hand to prevent its sliding clear out of the V-cut. Now a clamp holds the barrel in the V-cut.

The heavy barrel, with its freedom from "whip," or bending in firing, and the accurate V-cut in the steel base make possible the delivery of 100 shots with no inaccuracy that can be measured. If the ammunition could be made accurately enough, and the wind would refrain from blowing, this improved Mann rest could almost put one bullet on top of another at a

Testing Small-Arms Ammunition at Government Station, near Daytona, Fla.; Bullets Are Shot at Screen Target Placed Fixed Distance from Gun for Measuring Angles of Departure



half mile. The speed of the bullet is tested by an instrument called the chronograph, which merely balances the distance a weight falls against the time taken by the bullet to travel about 150 feet. The bullet cuts a wire as it leaves the muzzle, breaking an electric circuit passing through an electromagnet and permitting a heavy weight to fall. When the bullet reaches the other end of the testing distance, it strikes and drives back a loose steel plate, breaking another electric circuit passing through a second magnet. This second magnet controls a spring-actuated trigger and knife. The knife blade, thus released, flies out and makes a mark in the weight released by the first electric circuit. This nick or mark, cut into the lampblack weight of soft lead or brass, shows how far the weight fell before the knife struck it, and thus how far it fell while the bullet was passing over the measured distance. The rate of fall of a heavy object is easily ascertained from tables on hand, and it is thus converted into fractions of a second.

The internal pressure developed by the cartridge in the barrel of the gun is measured by drilling a hole in the barrel at a point about opposite the "neck," or mouth, of the cartridge. A little shallow copper cup is pressed down into this hole until it reaches the cartridge, then a steel piston just fitting the hole is pushed down until it reaches the copper cup or gas check. Above this is placed a short piece of copper rod, measured exactly as to its length.

An "anvil" or block to hold the copper is screwed down against the copper rod, while a housing attached to the barrel holds the steel anvil. When the gun is fired, the gas cuts a little round section out

of the cartridge case and then drives the steel piston violently outward. This, in turn, compresses the section of copper rod against the steel block above it, shortening the copper perceptibly. As the amount of force to shorten the copper rod is known by test of the lot in a static machine, a simple measurement of the shortening produced by the shot, gives the internal or chamber pressure.

With very low-pressure arms, such as shotguns and .22 rifles, the compressed material is lead instead of copper.

Recoil is measured by firing the cartridge in a heavy gun swung by wires, and measuring the distance the thrust moves the gun backward.

Shotguns and shotgun ammunition require a different method of testing. The performance of a shotgun is judged by the "pattern" or distribution of the pellets on a large piece of paper or white-washed steel plate, and on the penetration given by the pellets. The standard distance for pattern testing is forty yards, and the standard circle is thirty inches in diameter. A full-choke gun should throw seventy per cent or more of its charge into this thirty-inch circle.

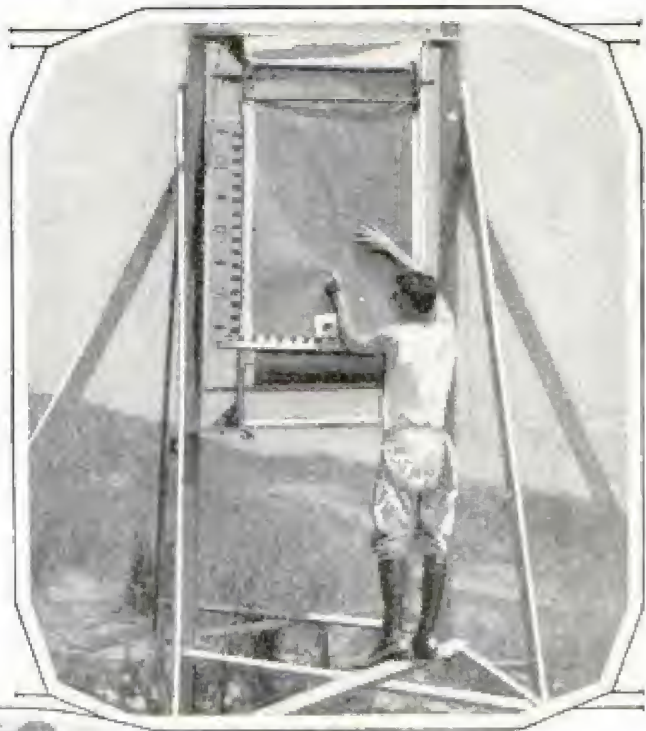
A third test of shotgun performance is of more modern type and is more difficult; this is to determine in how long a column the shot travels from muzzle to the mark. Some guns and some loads tend to "string" their shot in a long column. The final "pattern" does not show this stringing because all of the pellets eventually arrive at the paper, but with a fast-flying duck crossing the column, only a few of the shot would strike it because of the number lagging behind. Tests showed that with some loads and powders, the shot

column was as long as fifty feet when the leading pellets had reached a point sixty yards from the gun.

Modern developments in progressive-burning shotgun powder tend to reduce this stringing, and thus create a much more deadly load, although the pattern board and the penetration rack showed both sorts of powder acting about the same. Neither board nor rack could show the shot stringing, which is told by scientific apparatus.

One method of detecting stringing is to fire the gun at a rapidly revolving disk of large size. Obviously the pellets lagging behind strike the disk at a different spot from the leading pellets. The speed of the disk being known, it is easy to calculate how far behind the later pellets were traveling. Incidentally, the whirling-disk scheme was used for testing ammunition intended for airplane machine-gun use, in which the gun had to fire in the intervals between the whirling propeller blades.

Obviously, if the discharge was late, the bullet might strike the blade of the propeller. Ammunition for this purpose was fired at a revolving disk and if the shots in the "burst" occupied more than a certain sector of the disk, the lot of ammunition was thrown out as being dangerous.



Inspecting Screen after Shot, to Determine Bullet's Angle of Departure on Long Flight, and Preparing the Mann Rest with Special Telescope for Trial Shots; This Is an Improved Support, to Hold the Special Rifle Barrel When Firing, and Is So Accurately Adjusted That if the Ammunition Were Perfect and the Wind Didn't Blow, Bullets Could Be Put on Top of One Another at Half a Mile; Below, Measuring the Groups to Compute Final Results in Ammunition Tests



And Fred O. O'Leary,

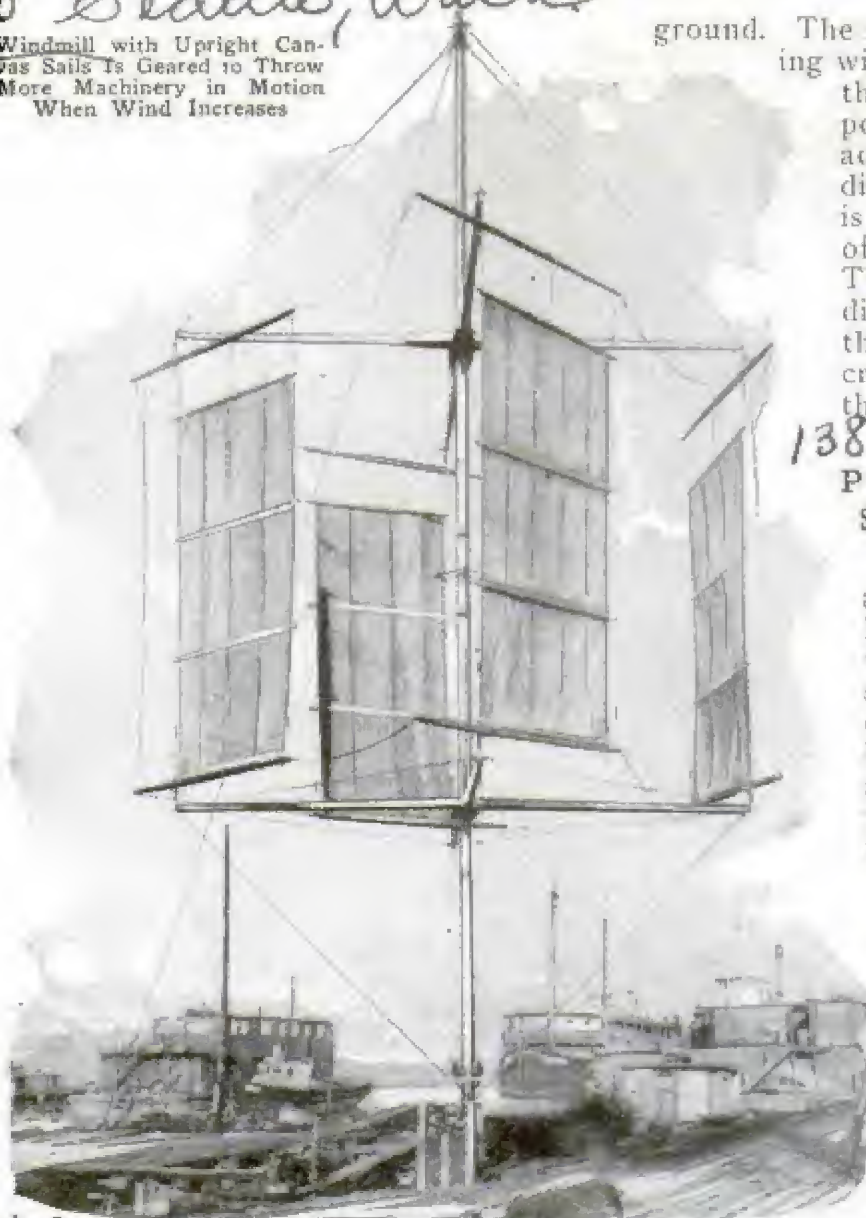
806

Attorney,

POPULAR MECHANICS

1270 Seattle, Wash.

Windmill with Upright Canvas Sails Is Geared to Throw More Machinery in Motion When Wind Increases



1270

WINDMILL WITH CANVAS SAILS DEVELOPS GREATER POWER

Said to be capable of developing from five to twenty horsepower, a windmill rigged by a western inventor has four upright canvas sails, each seven by fifteen feet, instead of the customary rosette-type of wheel. The sails are supported from spreader arms fastened to a center pole, and are about fifty feet from the ground. Theoretically, the canvas propellers are supposed to convert seven-eighths of the velocity of the wind into power, but actually they pull only during three-fourths of each revolution. The center shaft is mounted on a universal joint to avoid absolute rigidity and to give a certain amount of flexibility to the bearings. An advantage claimed for this arrangement is that a comparatively simple superstructure is required, all the power-converting machinery being on the

ground. The mill is regulated to increasing winds, not by taking it out of the line of the breeze, as is possible with a wheel, but by adding to the load instead of diminishing the power. This is done by means of a series of trips actuated by the wind. They automatically add additional pumps or motors as the velocity of the wind increases, and release them as the wind subsides.

1387

PLANTS' HEARTBEATS SHOWN BY SCIENTIST

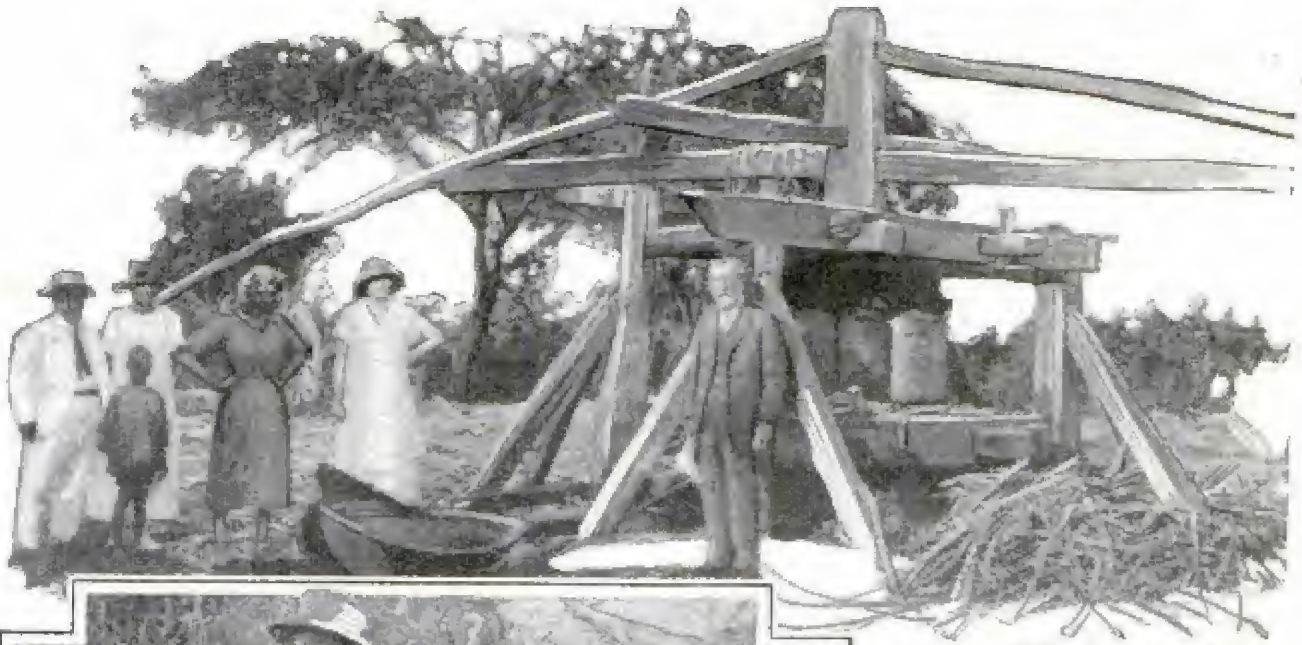
With the aid of carefully adjusted instruments which he has invented, Sir Jagadis Chandra Bose, an Indian scientist is reported to have demonstrated the "heartbeats" of plants and to have solved one of the questions that has puzzled scholars for many years, why sap flows upward. The "heart" was located by means of an electric probe in circuit with a sensitive galvanometer. The probe was introduced step by step across the stem of the plant until it came in contact with the pulsating layer. This produced an electric response which was recorded. The scientist is said to have

discovered that each active cell, while expanding, absorbs water from below and expels it upward during contraction. He likens the heart of a plant to that of the elongated organ in some of the lower animals, such as the earthworm, and declares that the life mechanism of plants is similar in many respects to that of living creatures. By means of an amplifier the plant's heartbeat was measured and found to be less than a millionth of an inch. A specimen's reaction to chloroform was demonstrated to an audience by causing the apparatus to throw a beam of light on a screen. The drug at first greatly stimulated the plant, but this result was followed by a death spasm, shown by the rapid fluctuation of the light beam until it finally came to rest. According to the investigator's experiments, inorganic substances also exhibit fatigue similar to that of muscles and this is removed by a period of rest.

Soo Calcutta, India.

Journal of American Medical Association

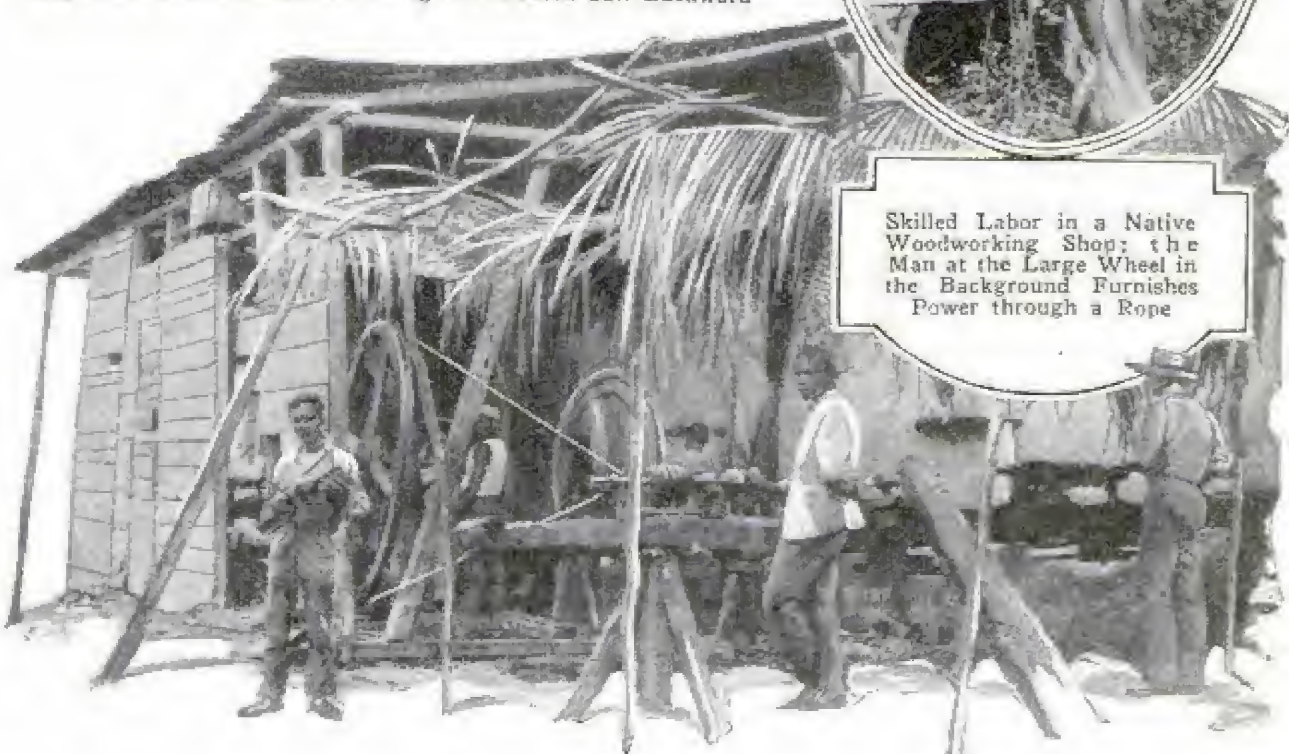
1206. *Wm. H. C. Smith, Bureau of Sales*
 Washington, D.C.
 Where Men Do the Work of Machines



Industry Still Lags in Haiti;
 Above Is a Native Cane Mill,
 Operated by Ox Power



Native Tinsmiths Work in the Open and Use Discarded Oilcans for
 Material; These Men Are Making Cups, Graters and Funnels; at the
 Right Is a Native Carpenter, Using His Modern Saw Backward



Skilled Labor in a Native
 Woodworking Shop; the
 Man at the Large Wheel in
 the Background Furnishes
 Power through a Rope

Bureau of Streets pays these
are not lights but
808 inserts.

POPULAR MECHANICS

1/23/26

SAFETY LIGHTS IN PAVEMENT PROTECT PEDESTRIANS



Flat-Faced Pavement Lights, to Mark Safety Zone at
State and Madison Streets, Chicago

So that street safety zones can be plainly distinguished at night, electric lights with flat surfaces, flush with the top of the pavement, have been installed at a busy intersection in Chicago. The lamps also help to identify the area in the daytime, even when not lighted, as the glass lenses form a distinct contrast to the dark paving.

CURIOUS "ONE-MAN" TRADES

Nearly all professions are overcrowded but there are a few occupations with only one follower, so far as is known. An Englishman, in the census returns, stated that he was a walrus-moustache collector. The hairs which are exceedingly thick, are used for making tooth-picks. London has only one moss gatherer. He

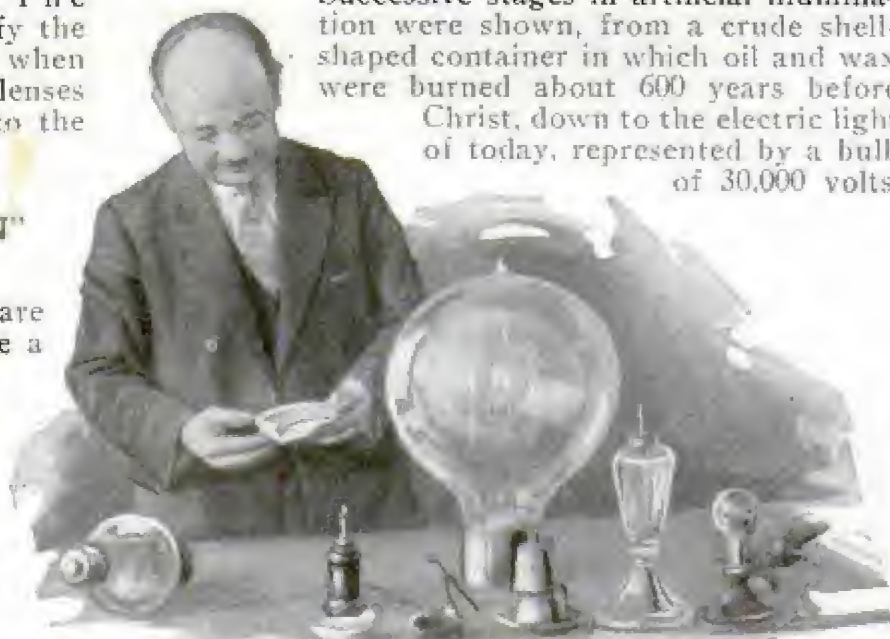
pushes a wheelbarrow twice a week to a place several miles from the city where he collects fresh moss and sells it for decorative purposes. An American woman makes a business of giving suitable names to babies. Only one man at a time in the subtreasury at Philadelphia is said to know how to stack bags of coin so they will form a solid wall and not fall down with possible injury to persons near by. When he retires, he teaches the secret to someone else. Not long ago, London's list of tradesmen included a professional "champagne disgorgier." His task was to remove sediment without losing any of the wine. The bottles were placed upside down in a rack to permit solid material to collect on the corks which were then extracted in such a manner that the sediment was thrown out but none of the champagne spilled. There is but one woman veterinary surgeon in England and; until a few years ago, only one Englishman pursued the trade of making wicker arm-chairs for dolls. Another little-known occupation is that of breeding toads to sell to gardeners for destroying insect pests. For thirty-six years, a man was employed by a British factory just to strike matches to test them, and London has a man who sells asses' milk which is highly prized by some for its nourishing qualities.

MAN'S PROGRESS IN LIGHTING SEEN IN LAMP EXHIBIT

Some twenty-five centuries of human progress were visualized at a glance in an exhibit of lamps displayed at the General Electric company's plant in Newark, N. J.

Successive stages in artificial illumination were shown, from a crude shell-shaped container in which oil and wax were burned about 600 years before

Christ, down to the electric light of today, represented by a bulb of 30,000 volts.



From Oil Dishes to Brilliant Electric Bulbs, the Story of Man's Development of Illumination at a Glance

General Electric Co.
Newark N.J.



© Harris & Ewing

Part of the Easter-Monday Egg-Rolling Crowd on the Rear Lawn of the White House, When Thousands of Gayly Painted Eggs Are Rolled down the Hill in the Background

Every Day a Holiday at the White House

There's Always Company Arriving and, to Add to the Festive Atmosphere, Comes a Constant Stream of Gifts

THERE'S a place in the United States where every day is a holiday and where the Christmas spirit, at least that part involved in receiving presents, flourishes 365 days in ordinary years and one more in leap year. The place is the White House at Washington and the recipient of all this attention is the president of the United States.

The holiday spirit is not his choice or desire, in fact it sometimes interferes seriously with his work, but when virtually every visitor to Washington insists on a call on the chief executive he perforce becomes a party to the celebration. Anyone who regrets that Christmas and birthdays or other gift-giving occasions come so seldom may envy the president's annual crop of presents, which runs around 2,000 or so a year, with rarely a day passing without anywhere from a few to a couple of dozen arriving. And the list of gifts covers about everything from animals to framed poems.

Kangaroos, clothes and walking sticks;

pocketbooks, pictures and prunes; toys, tools and tobacco—the list of things sent President Coolidge in the last year is almost endless in its variety. It takes a special clerk to keep track of all the gifts and see that the donors receive the treasured note of acknowledgement on the White House stationery.

Not all gifts are accepted. If the White House suspects an effort is being made to use the president for advertising purposes, the present is politely rejected. Last fall President Coolidge declined to accept an apple pie from his own home state Vermont because his name might be thereby linked with publicity for an eat-more-apples week.

More than half the gifts received by the president in a year are books. Some are sent by publishers, some by the authors, and many come from individuals who have read and enjoyed a book and pass it on to the occupant of the White House in the hope that he may find the same enjoyment. Framed mottoes and poems ar-

rive by the dozens each year, most of them from women. Photographs and drawings of the president and pictures of babies named for him constitute another large part of the gift shower.

Fruits, groceries and household supplies arrive in wholesale lots from admirers every week. The Thanksgiving and Christmas holidays always bring from one to a half dozen or more enormous turkeys. Housewives who pride themselves on their jellies, their cakes or their beaten biscuit send generous samples, and farmers pick their choicest produce.

The idea behind many of the gifts lies in news stories about the president. One day he advised a delegation of schoolboys to wear suspenders and as a result himself received some six dozen pair. His electrical horse attracted quite a bit of attention, and a manufacturer immediately brought out a children's size exerciser and sent several dozen to the White House with the request that the president give them to Washington children at Christmas. On his vacation in Vermont Mr. Coolidge tried his hand in the hay field, and a gift of a pair of overalls and a rake shortly followed. He tinkered a bit about his father's farm, and the postman shortly delivered a saw and a screwdriver.

With the perpetual tide of callers, who make every day an event at the White House, it takes a well-oiled machine to keep the business of the government running smoothly. The president must attend to his office, meet all delegations, pose several times a day for his photograph, surrounded by the delegates, deliver speeches from the steps to more important committees, shake hands once a day with all comers, meet distinguished visitors, confer with the cabinet, and in between find time to eat and take exercise.

Despite all its ramifications, the business of the executive mansion moves so smoothly and mechanically that the thousands of visitors are rarely conscious of the behind-the-scenes side of White House life.

Easter is the most crowded period of the year in Washington, with thousands of school children and teachers spending the vacation there sight-seeing. The city is at its best then, with the famous Japanese cherry trees in full bloom, and the egg rolling to see.

All in all, life in the big white mansion is a fairy-story existence in which week days never come, but it is known that every president soon begins to long for a bit of quiet and peace.



© Harris & Ewing

President and Mrs. Coolidge Receiving a Delegation of Wounded War Veterans at a Garden Party for the Soldiers Receiving Treatment at the Hospitals near Washington



While Natives Gather the Eggs in Crates and Wheelbarrows, the Big Birds Walk Unprotestingly among Them, Apparently Unaware That Their Nests, Exposed on Rocks, Are Being Robbed

TONS OF BIRDS' EGGS GATHERED FROM PACIFIC ISLAND

Natives periodically reap a rich harvest in albatross' eggs when they visit the little island of Laysan, one of the Hawaiian group in the middle of the Pacific ocean. Literally tons of the eggs are picked up at one gathering. They are shipped to markets on other islands near by. The birds are generally too slow to catch fish, but live on small shellfish and can swim and fly with equal facility. Their "singing" is said to bear a close resemblance to the braying of an ass.

APPLE-TREE DISEASE TREATED WITH MERCURY COMPOUND

Development of a method for the control of crown gall, a disastrous disease that attacks root-grafted apple trees is reported by the department of agriculture. The system involves the use of a recently prepared organic mercury compound which is said not to injure the roots of the trees. In experiments conducted during 1925, of 2,619 grafts treated, little more than six per cent were afflicted with galls at digging time, while the same number of untreated specimens showed the disease in much larger proportions, almost thirty-three per cent of the lot being infected. In handling the trees, the experimenters used precautions similar to those practiced by surgeons. Implements were carefully sterilized and cleaned with disinfectant, for the disease is caused by a germ. It is believed that the new remedy promises savings of millions of dollars annually, as the gall commonly causes losses of

twenty-five to fifty per cent in grafted apple trees, and sometimes as much as ninety-five per cent.

VIOLIN PAD OF SPONGE RUBBER EASES PLAYER'S POSITION

Readily adapting itself to the shape of the neck and shoulder, a cushion of sponge rubber to support the violin, enables the player to assume an easy position, prevents fatigue and, in the case of beginners, helps them acquire correct posture and bow handling. The cushion slides back and forth on a movable arm, which is pivoted to a small bracket attached to the



Upper View Shows Cramped Position of Player without the Violin Support; Lower with It in Place, Permitting Greater Ease



chin-rest mount so that almost automatic adjustment is made to any style of play.

E. A. du Pont de Nemours & Co.,

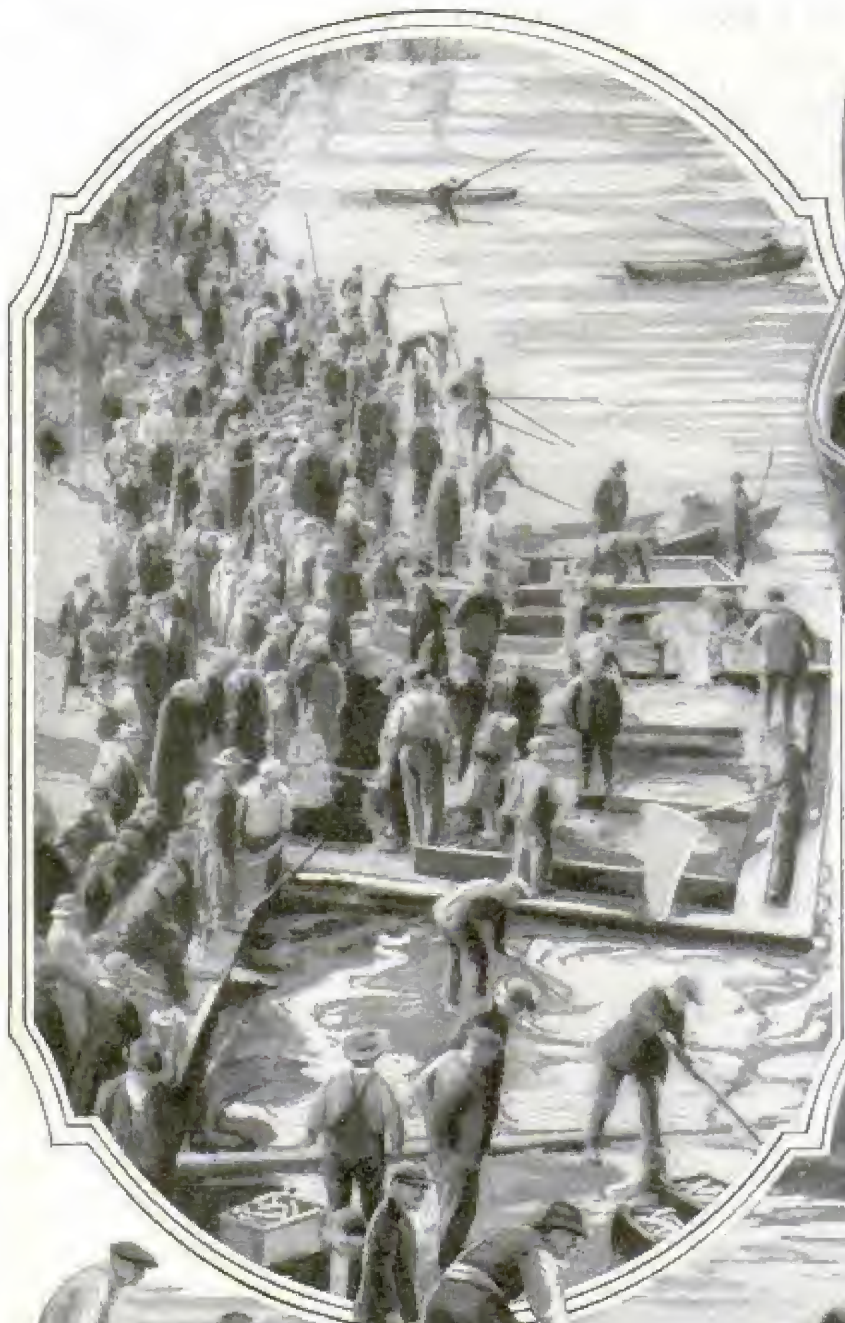
Wilmington, Del.

(Chas. Williams)

Meyers

International

William Lewis and Son, 207 S. Wabash



Basket of Smelt and Scenes While Taking Part of the Annual Run from the Cowlitz River, Washington; the Fish Ascend Fresh-Water Streams for Spawning in Such Numbers That They Are Easily Scooped Up with Basket Nets; for Years, Little Use Has Been Made of Them, but Packing Plants Are Now Salting and Shipping Them to the Orient



Stephen and Ruby Thompson

SMELT PRESERVED BY SALT ARE SHIPPED TO THE ORIENT

For many years, fishermen have been perplexed to find use for the billions of smelt that annually appear in the rivers of the Pacific northwest for the spawning season. They come in such numbers that they can be easily caught with scoop nets by persons standing on the banks, but while considerable quantities have been shipped to the city markets, the great bulk of the run has never been utilized. Recently, a new industry has been created in one district in salting and packing the fish for shipment to China, Japan and other parts of the orient. The first pack aggregated 500 tons, and plans have been made for extension of the industry. The smelt, in size and appearance, resemble silver trout. The meat is white, oily like that of a salmon, and there are few bones. About six of the fish make a plentiful meal for one person.

SHOE-SOLE PAD FOR BOWLERS PREVENTS SLIPPING

Quickly attached to ordinary street shoes, a durable pad, patented by an eastern inventor, prevents bowlers from slipping, saves the shoes and makes purchase of an extra pair unnecessary. It is securely held by tabs and a short strap, and can readily be adjusted to widely varying sizes of shoes. A pair of the pads occupies little space and can be carried in the pocket.



☐ The Popular Mechanics' Bureau of Information offers its free service to all readers of our magazine. Names and addresses of manufacturers and dealers in articles described will be promptly furnished by addressing the Bureau.

W. George C. McAuley
155 Church St.
Highland Park, Ill.

RADIO CABINET AIDS THE DEAF BY SOUND VIBRATIONS

Radio has been adapted to the treatment of certain forms of deafness in a



Top of Radio Sound Amplifier, Showing Controls, Tubes and Meters Which Indicate Volume; Phonograph in Front, to Furnish Music for Test

cabinet which amplifies sounds. The intensity of the tones can be widely varied to suit the needs of the patient, who wears headphones and endeavors to hear music or speech from a phonograph record or the human voice spoken through a telephone transmitter into the cabinet. The vibrations stimulate blood circulation in certain parts of the ear, help to loosen the small bones and muscles if they are too rigid, and thus aid nature toward the restoration of normal hearing. Several persons may receive treatment at once with this apparatus, and an additional advantage is that a deaf person may hear the sound of his own voice by speaking through the mouthpiece himself.

LINERS TO CARRY AIRPLANES SHORTEN VOYAGES

Two steamers for passenger service between the United States and ports on the Mediterranean are to be equipped with facilities for carrying and launching amphibian airplanes from their decks, according to news dispatches. The innovation will permit passengers to reach their destination as much as two days before regular schedule time.

Cosulich line
Saturnia and Umana

André G. Wabach, Chicago

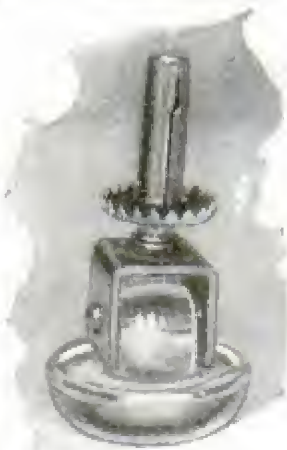
Time and Money-Saving Tools



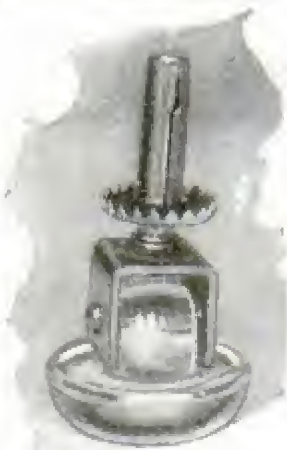
Is the Egg Good? Mirror Cup. Below. Quickly Answers the Question; a Clear Reflection from Glass Indicates Unspoiled Egg; Spots or Streaks, Doubtful



Funnel Top Transforms Fruit Jars into Measures, While Spout Permits Pouring without Spilling; Tube Is Handle and Air Vent



Glass-Tipped Caster Permits Sliding Furniture over Floors without Damaging Wood or Rugs



Women Who Make Their Own Clothes Can Mark Their Skirts without Assistance, While Wearing Them, with Simple Arrangement at Right



Clamped to the End of Ordinary Toothbrush, an Auxiliary Set of Bristles Helps in Cleaning Artificial Sets



for Woman's Workshop in Home



Unpleasant Odors in the Refrigerator Are Absorbed by Substance Held in Wire Cone; Heating Renews the Material



On This Improved Gas Range with Special Dampers, Cooking on Cast-Iron Top, Baking and Heating Water in Coil Can All Be Done at Once with Only One Burner; It Utilizes Much of the Heat Lost in Ordinary Range



Lightweight Baby Carriage Has Package Carrier in the Back; at Right, Spring-Wire Catch on Pole Keeps Clothesline in Place Even When There Is a Heavy Wind

\$3.00 per pair



Chicago W. J. Hoover
 326 206 Hearst Bldg. Chicago
 W. Madison J. Chicago
 Arrow points to Automatic Holder in Place at Top of Door and Entire Brace
 Is Shown Below; Slight Push on Door Releases It

AUTOMATIC HOLDER FOR DOORS PREVENTS SLAMMING

Easily adjusted and sure in operation, automatic holders for the garage doors prevent damage to the car or to the doors themselves and make it unnecessary to use bricks or other makeshift props. A latch engages a catch to secure the doors, and in closing them the leaf is opened a trifle wider, permitting the catch to be released. This arrangement prevents the wind from closing the doors.

STORIES OF PREHISTORIC LIFE 1211 TOLD IN COAL BEDS

Scenes from Jules Verne's "A Trip to the Center of the Earth" and what the English professor saw as he journeyed down one of the craters of Iceland and out through a volcano in Italy, can almost

be duplicated on a scientific basis by interpretation of the fossils discovered in coal beds and in the layers of rock over the deposits. Form, texture and size of plants and trees that flourished ages before history was written by man, are revealed in the natural record left in silts that hardened into stone. "freezing" the imprint of ferns and leaves as an album presses specimens placed between its pages. Prof. A. C. Noe, of the University of Chicago, visions a typical coal landscape of that early age as an enormous swamp stretching over a territory now occupied by several states. Vegetation was prolific and tropical in character, but practically odorless and monotonous in its prevailing greens, yellows and browns. Trees bearing tufts of narrow leaves and covered with bark that had scales like those of an alligator's skin rose to a height of 100 feet. Their only living relative today is the small club moss with which gardeners trim bouquets and flower

beds. The trees propagated by spores which contained oils and other fats as food for the young plants. Cannel coal today is rich in oil because of the quantity of these spores in it. This was also the age of the tree ferns, similar in appearance to those now found in New Zealand and the South Sea islands. The absence of regular flowering plants was a distinguishing characteristic of the period. They did not develop extensively until centuries later, when pollen-bearing butterflies and bees appeared. No mammals existed, reptiles were small, and millions of years elapsed before the first great dinosaur was born. The swamp waters were filled with fish and odd crustaceans; oysters and clams could be found in abundance, while huge dragon flies, some with a wingspread of thirty inches, flew through the air. After thousands of years, the sea rushed in and covered this huge swamp where the great

coal fields of the east and the middle west are now being developed. Shales formed by this inundation preserved some of the evidence of the former swamp vegetation. Another long period elapsed and the sea receded giving opportunity for a second swamp and more vegetation, but it returned, burying the new growth and forming another coal seam.

REACTION TO FEAR MEASURED BY EYE PUPILS

That emotion can now be described quantitatively, is the assertion of two scientists at Columbia university who have been conducting an interesting series of tests with human subjects in an effort to measure their reaction to fear. While the person under observation is seated in a darkened laboratory with his hands fitted into cuffs, a pistol is suddenly discharged close to his head or a noisy automobile horn is sounded or he feels the writhing coils of a large snake unexpectedly placed about his neck. If his eyelashes flicker or the pupils of his eyes dilate the least bit, instruments record the fact and how much, while other devices register changes in pulse and blood pressure. About the subject's waist is strapped an apparatus which transmits variations in his breathing to a chart. Before the fear stimulus is introduced, the normal pulse, blood pressure and respiration are recorded by means of the instruments. The sudden variations of the needles as the person is disturbed, give the experimenters a clue as to just how much he reacted. The scientists explain that they regard their work as of chief interest to psychologists, with little practical value to science in general. They hold that there is a relation between dilation of the pupils, quickened pulse and other manifestations of fear and are seeking that correlation.

Without Disturbing Wrappings, Scientists Can Examine Interior of Mummies by X-Ray Photographs



Smashing through Pane of Plate Glass at Sixty Miles an Hour, Motorcyclist Received Only Two Small Cuts on Face

CYCLIST RIDES THROUGH GLASS AT SIXTY MILES AN HOUR

Crashing through a huge pane of glass erected within a frame support, a daring English motorcyclist suffered only two slight cuts on his face. His speed was sixty miles an hour, but cameras "stopped" the action almost perfectly, even to registering tiny fragments broken off by the impact. One side of the pane was seen just falling from the edge of the frame.

X-RAY PHOTOS OF MUMMIES REVEAL ANCIENT SECRETS

With the aid of an X-ray outfit, the prying eyes of science have been able to peer through ancient mummies without disturbing the wrappings. Several specimens have been examined in this way at the Field Museum of natural history. Study of articles of personal adornment and evidence of various physiological facts as revealed by the X-ray pictures enable the experts to gather data concerning the health and habits of persons who lived thousands of years ago. Among them was an Egyptian mummy believed to be 9,000 years old.



George C. Schomberg
and Mortimer S. Adler

Chicago
W. Jackson Blvd.
Victor X-Ray Corp.
German Technical
Edw. C. Schomberg

CANADA TO HONOR WAR HEROES
WITH NATIONAL MEMORIAL



Model of Proposed War Memorial to Be Erected for
Canadians near Ottawa

In commemoration of the sacrifices and services of Canadians during the World War, a national memorial is to be erected at Ottawa. The prize-winning design, selected from plans submitted by artists and sculptors from all over the world, shows a procession of soldiers passing through an arch as though in triumphal celebration of victory. The work will cost approximately \$100,000, it is reported. The statue was designed by Vernon March of Kent, England.

WHITE PAINTS ARE
REALLY GRAY
TESTS SHOW

That all our so-called white paints are really gray, is the conclusion of chemists at Cornell university after a series of tests. They found that light was absorbed to a slight degree, so that the paint reflected less than was shining upon it. The ratio between the amount of illumination thrown back and the amount reaching the paint surface, the experimenters declare, may be

taken as a measure of the brightness of the paint. The chemists say that the ability of a paint to obstruct the transmission of visible light rays and its ability to obscure the surface upon which it is applied, are really the same thing. During the tests, it was discovered that when a small amount of dark pigment, such as carbon black or Prussian blue, was added to white paint, there was a much greater increase in the "hiding power" of the film than decrease in its brightness.

EARTHQUAKES PROVE BLESSING
INCREASING FLOW OF SPRINGS

While the recent earthquake in Santa Barbara, Calif., did great property damage, it left an unexpected compensation by increasing the flow from subterranean springs. The waters are filled with minerals and are considered of medicinal value. Scientists declare that the Japanese earthquakes likewise have been blessings in disguise, for they have been instrumental in exposing deposits of valuable ores or have made access to them possible.

STUDY ODORS INSECTS PREFER
IN ORDER TO POISON THEM

With the aid of apparatus which shows which odors insects like best, a scientist in the department of agriculture devises bait for traps or for poison dishes, to destroy various pests. He has discovered that insects of many kinds are guided by the sense of smell in selecting food and prepares lures likely to attract them.



With This Complicated Apparatus, Scientist Discovers What Odors Various
Insects Prefer So That He Can Prepare Poisons



The Romance of the Molders of Stone

Concrete Covers the Land and Sails the Seas in the Form of Ships, All in One Generation

FROM a crude and little used product hardly thirty years ago, in the days when the automobile was young, cement has leaped to the fore as the world's most amazing building material. Hardly a day passes but some new use is found for poured and molded stone, one of the latest being the construction of automobile bodies in Europe.

Thirty years ago cement had begun to supplant stone slabs for sidewalks, and the government built a small barge-canal lock of it out in the Illinois prairies. The material was not new, but had been known, and used, for ages. Foundations of the Roman temples, made of poured concrete, are still standing long after time and the elements have cracked and felled the marble columns and arches. The walls of the House of Augustus, poured in 36 B.C., show every grain of the crude wooden forms in which they were molded.

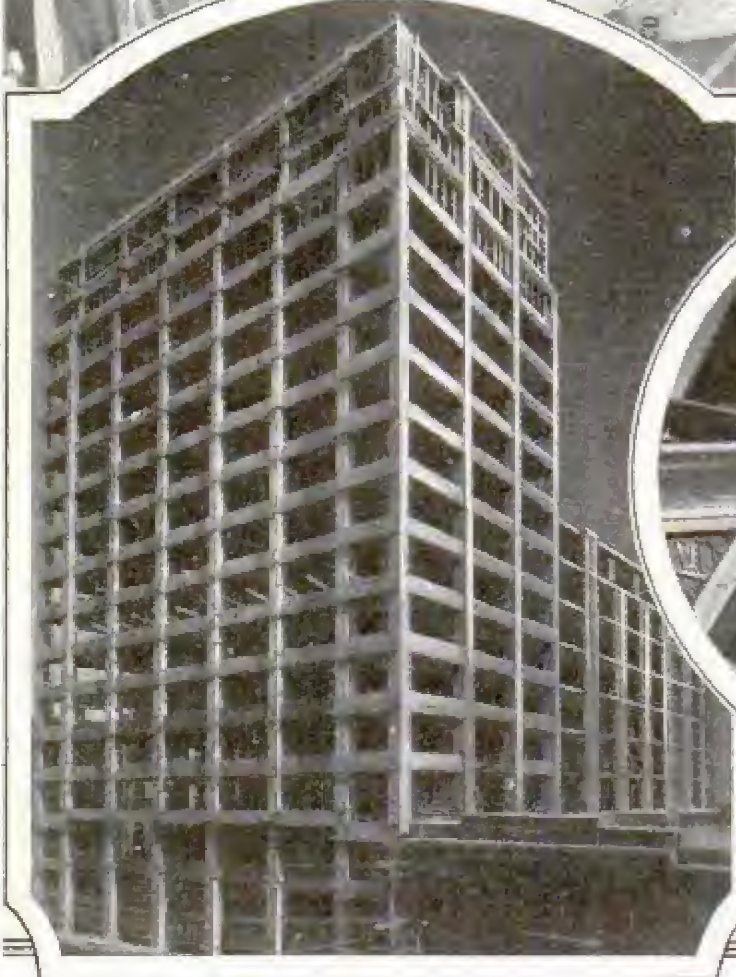
Concrete really came into its own about the time that the automobile made better roads necessary, and at the same time engineers searching for a new, strong and quickly erected factory-building material turned to cement for the answer. The

steel-frame skyscraper had begun to revolutionize building practice with the possibility of a self-supporting framework, to which thin walls could be attached to keep out heat and cold and provide privacy. A few crude experiments in concrete construction, followed by the development of special apparatus and the invention of reinforcing steel, started concrete on its way.

From that rough start, one of the largest industries in the country has grown. The invention of the rotary kiln, huge horizontal cylinders, hundreds of feet long, in which the powdered rock can be cooked into cement, speeded up production. Enormous crushers mash the rock brought from the quarries, the big kilns subject it to intense, fusing heat, and crushers again reduce the caked cement to its final powdery form.

From the powdery dust, mixed with water, sand and gravel and reinforced in many cases with bars of steel, come houses, offices, factories, roads, bridges, dams, canal locks, breakwaters, amphitheaters, grain elevators, coal pockets, barns, silos, chimneys, troughs, fence

Right, Footing for Sky-scraper Pillar, with Heavy Reinforcing in Place; the Concrete Base Slab Rests on 168 Concrete Piles Driven Down to Solid Rock; Below, the Monolithic Floor of a Reinforced-Concrete Hotel Being Smoothed Out Before the Cement Sets



Sixteen-Story Reinforced Concrete Building, at Left, Is One Solid Piece, Insuring Greater Strength Than Old-Fashioned Construction Methods; Above, Tamping the Cement Down

posts, ornamental light posts, telephone poles, benches, sundials, bird baths, vases, urns, pedestals, lawn rollers, laundry tubs, statues, tombstones and even outer coffins.

Poured as a liquid, it becomes, in a matter of hours, a rock that grows harder and harder with age. It resists both fire and water and, when properly made, stands up under the roughest treatment. On the sea it is represented in many ships, and it travels on land as concrete freight cars.

The amount of it used in the United States last year was sufficient to have built thirty-four replicas of the great pyramid of Egypt, which 100,000 slaves consumed twenty years in building, or a total production for each slave of thirty cubic yards of masonry in twenty years. Compared to that, working with liquid stone and modern methods, five cubic yards can be laid now for each man of the crew in a ten-hour working day.



Huge Reinforced-Concrete Tile Section and, Left, Spray Gun Being Used to Coat a Fence with Liquid Stone



Roads alone, during 1925, absorbed something more than twelve and one-tenth million cubic yards of concrete paving, but the production of automobiles more than kept

pace with the extension of the hard highways, so that the immense surface of roads laid was not much more than enough to stand the new cars on. The output of roads equaled three cubic yards for each car built during the year.

The total consumption of concrete last year, according to estimates of the industry, was 103,000,000 cubic yards, which fell only a few million yards short of enough to have duplicated the famous Great Wall of China, a job which took 300,000 soldiers and all the convicts and dishonest officials in the empire fifteen years to build. With modern concrete equipment the 300,000 soldiers alone could have mixed enough liquid stone in eighty days to have built the wall.



Boys at Mooseheart, Ill., Home of the Moose Orphans, Learning to Model Attractive Ornamental Pieces from Cement, Finishing with Sculptors' Chisels



Spraying Mine Walls with Cement to Prevent Dust Explosions. Above; and, at the Right, Movable Forms Used to Shape Concrete Flume

It is because of its plastic features that concrete has become the premier building material of the age. From the crude cement blocks of a decade ago to the poured stone of the present, which looks and wears like granite, is a long step in one direction, and working in a reverse way, the forward step from painstakingly carved granite statues of the past to the colossal cement-cast "Fountain of Time" of Lorado Taft is an equally great advance.

Real stone which can be carved with ease and which improves with age is rare. The delicate tracery that embellishes the famous monastery at Lisbon, erected as a tomb for the discoverer of the sea passage to India, was made possible by a supply of chalkline limestone which carved as easily as chalk itself, but which, when exposed long to the air, became hard as rock. With modern cement methods, the same effect can be obtained in a fraction of the time, with day laborers instead of skilled artists, and in addition, by mixing color with the ce-

ment or using granite particles as an aggregate, any tint desired can be obtained.

The new material, besides being plastic, can be handled in such a wide variety of ways that its applications are almost endless. From being poured in forms or molded into blocks, it is now sprayed on with a compressed-air gun in less time and with better results. Coated over wooden piles in this way and held in place by metal reinforcing, it pro-



protects the piles from the ravages of the destructive teredo.

In building construction it has been used for poured columns, beams and girders rising twenty stories or more above the ground, reinforced only by a slender network of steel bars and wires, and even the lofty steel-frame building has its iron pillars incased in cement.

Cement railroad ties are being tried out to replace wood, and the president of one big railroad—the Pere Marquette—predicts that the railroad of the future will have an entire roadbed of cement, giving a stronger and more even surface than gravel fill, and permitting trains, equipped with ball-bearing axles, to run with almost the speed of airplanes.

FOUR THOUSAND LAMPS DAILY
GOVERNMENT'S DEMAND

HOW PHONES HAVE IMPROVED
SHOWN BY OLD RECEIVER

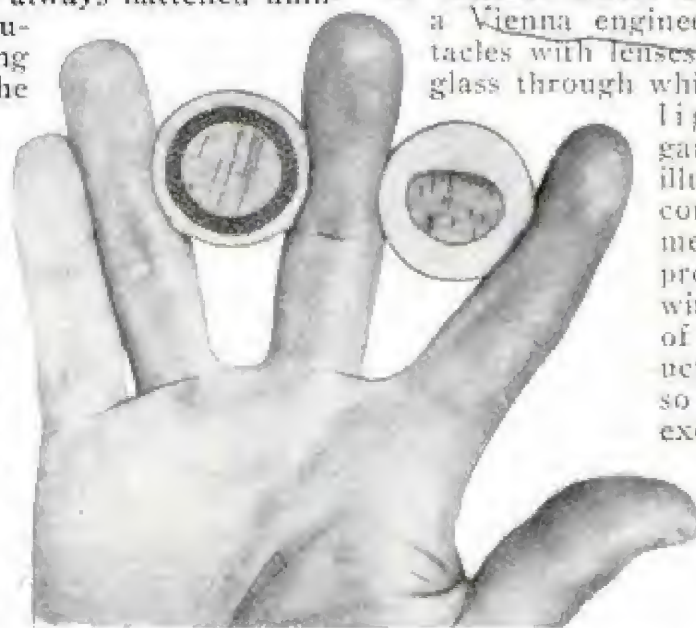
More than 1,500,000 electric lamps are purchased by the United States government each year, or over 4,000 daily, for the manifold illuminating systems of public buildings, battleships, laboratories, offices and warehouses. The demand includes almost every size of light from tiny bulbs for the lamps used in surgical operations to the big ones for searchlights. Samples of every type of light purchased are tested by the bureau of standards, which also does similar work for private concerns.

Included in the semicentennial exhibit of the telephone company in San Fran-



NEW CORE FOR "LIVELY" BALL
TO IMPROVE GAME

To make baseballs more uniform in "life" and flight and to stabilize hitting, a cork-cored sphere designed for use of the National league this year has two coats of rubber instead of one. It is expected that this will keep the "live" center from getting out of shape so easily, thereby preventing exposing more rubber on one side than on another and the uneven hitting that is likely to result. The so-called "rabbit ball" has been widely discussed in sporting circles for the last four years, as it has had an important effect on the number of home runs and the general conduct of the game. Walter Johnson has said on this subject, "No two balls can be made exactly alike; it can't be helped. Sometimes the same ball will have two or more degrees of liveliness, depending on the side on which it is hit. The cork center is always flattened unintentionally in manufacturing it, causing certain sides of the rubber coat, which is pressed into a sphere, to contain more rubber than the other sides. If the impact of the bat chances to meet the ball upon the side where the rubber is the thickest, it sails faster and farther than would be the case if the ball is hit in a place where the rubber happens to be thinner."



Courtesy Chicago Daily News

Baseball Core at Left Keeps Shape with Two Coats of Rubber; at Right, Result of Only One Coat

Today and Yesterday in Telephone Equipment; the Box Affair Is Bell's First Receiver

cisco was the first receiver made by Alexander Graham Bell. Its cumbersome size, exposed wiring and unhandy shape are in sharp contrast to the trim units developed during the past fifty years of telephone progress.

DAYLIGHT GLASSES FOR DYERS
AID IN COLOR TESTS

To enable dyers and textile workers of various kinds to detect the true shades of delicate colors under artificial lights, a Vienna engineer has devised spectacles with lenses of a special kind of glass through which the effect of daylight is obtained regardless of surrounding illumination. They are considered a simpler means of solving the problem than lamps with globes of this kind of glass, for the product is costly. It is made so that it filters out the excessive red and yellow rays present in most forms of artificial lighting, restoring the balance of blue and violet rays and the desired daylight effect.

Dr. Herman Weiss

Chas. E. Shackelford

Cent. O'Leary 14- Moulton Mendocino County.
Ch. L. Board of Trade

824

POPULAR MECHANICS
Chicago

MOVIE TICKER FOR BROKERAGE SAVES MARKING BOARD

1223

Sparing the time lost and the mistakes made in chalking the reports on a black-



Reading Stock Quotations from Movie Ticker; Figures Are Projected from Transparent Tape Directly from Receiving Instrument

board, a movie ticker in use at the Chicago board of trade shows the stock quotations directly from the receiving instrument on a transparent screen. Letters and figures are projected from a specially prepared tape instead of the usual paper ribbon. The characters are easily legible, being several inches high and, as the "film" moves from right to left, the latest as well as several of the preceding quotations are visible at the same time.

POISON WAR AGAINST COYOTES DOUBLES NUMBER OF SHEEP

123

That the poison campaign waged against coyotes and wild cats in a California county is producing good results is seen in the fact that the number of sheep has doubled during the past two years. This is largely due, officials say, to comparative freedom from the depredations of the wild animal killers. Before the poison war was started by the state, federal and county departments, one stockman

alone lost 400 sheep out of a herd of 9,500 during the summer period of four months. Last year, only fifteen out of a flock of 7,500 were killed. Where some 200 lambs were lost to coyotes and other marauders

among 4,000 ewes, only four were reported killed after the poisoning work. Ranchers say that they are now able to raise turkeys, pigs and chickens on the open ranges with almost no loss, whereas inclosures were necessary before.

HARNESS GEYSERS IN ICELAND TO GROW GARDENS

Visions of Iceland as Europe's kitchen garden may become a reality, to a degree at least, for geysers there already have been used in supplying laundries with hot water, and it is now proposed to pipe the flow under the ground and utilize the heat to stimulate the growth of plants

and vegetables. This already has been done in greenhouses as an experiment. Potatoes, planted earlier than possible outside, developed much more rapidly, and flowers have been grown with success.

AUTO BOLT WITH OILING VALVE IMPROVES LUBRICATION

224

Oil is distributed evenly and in the proper amounts to parts of the automobile chassis from a special type of bolt now on the market. The lubricant is controlled by a ball-and-socket valve in the bolt, situated between the oil-cup reservoir and the bearing. This valve prevents escape of the oil when the car is standing still, but when it is in motion, there is sufficient vibration to cause the ball to move, allowing enough oil to pass out to preserve the necessary film for proper lubrication. The design is suited especially to king-



Bolt Cut Away to Show the Oil Compartment and Ball-and-Socket Valve to Regulate Flow

bolts and to those located in springs and tie-rods.

*Hastoria Screw Co
 Astoria, Ohio.*

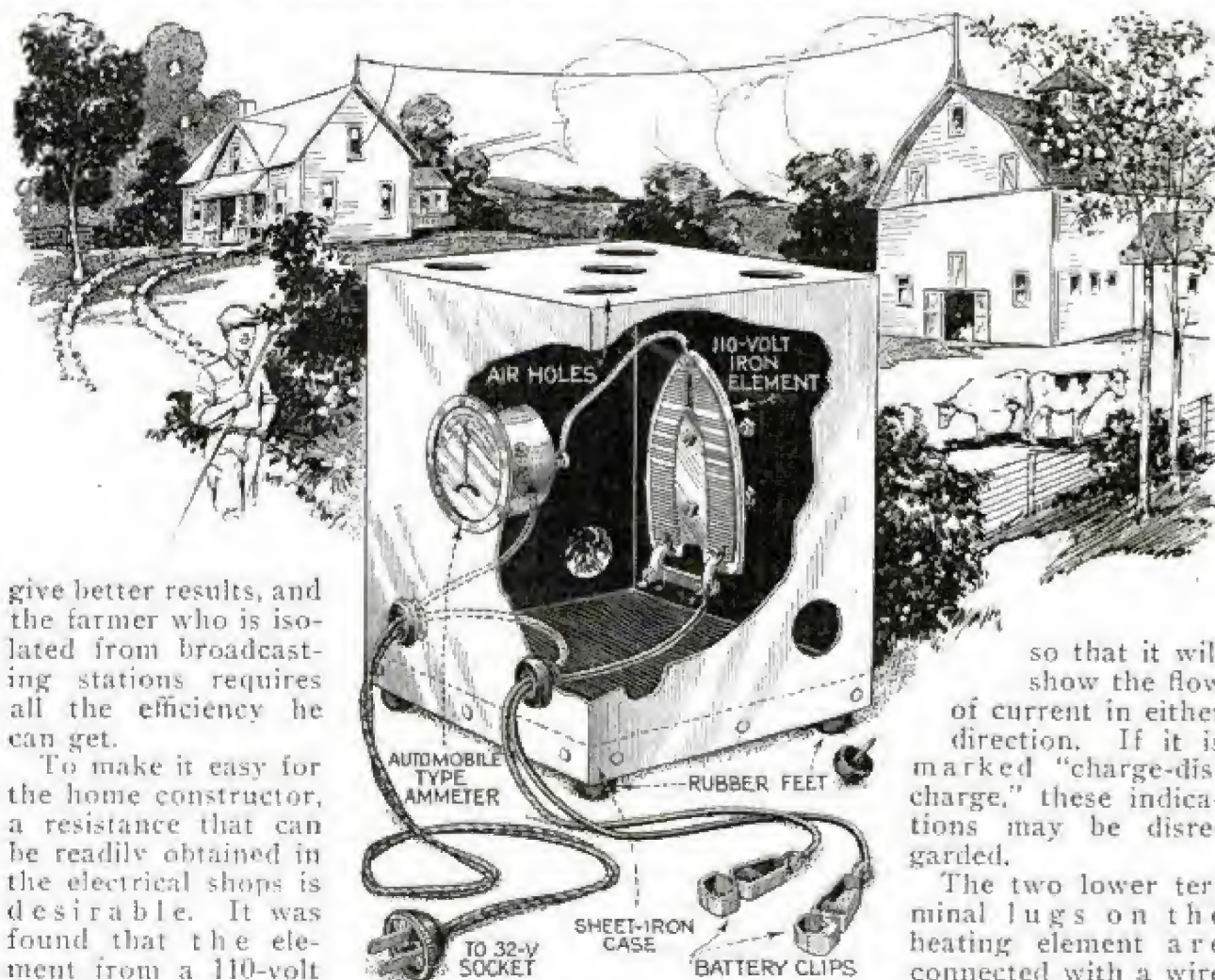
Journalist at Oregonian

Radio-Battery Charger for Farm Lighting Plant

By E. J. BACHMAN

CHARGING the 6-volt radio storage battery from the 32-volt farm-lighting plant is a simple matter, if a suitable resistance is used in one of the connecting leads, and the polarity of the connections is correct. It is not a good plan to tap off the A-battery supply from the plant itself as many try to do. A good 6-volt radio storage battery costs very little and will last a number of years if properly maintained. Regular charging is necessary for best results, and as very few farms are equipped with the current supply necessary to use the standard charging apparatus, many farmers have limited themselves to sets using the small dry-cell tubes. The storage-battery tubes

board is 1 by 6 by 6 in.; a piece of sheet or stovepipe iron, 6 by 24 in., is laid out as shown in the blueprint diagram, and the holes are drilled or cut for the meter, bolts, nails and ventilation. The metal sheet is then bent on the dotted lines and fastened to the base with small nails. Rubber-headed tacks are used under the base for feet; after the sides and base have been assembled, mount the element with two $\frac{1}{4}$ by 2-in. stove bolts and nuts, so that it stands clear of the back and sides, to allow dissipation of heat. The element will warm up in use, but does not get so hot as when used in the electric iron. The ammeter is of the common automobile-dash type, with a 20-0-20 scale,



give better results, and the farmer who is isolated from broadcasting stations requires all the efficiency he can get.

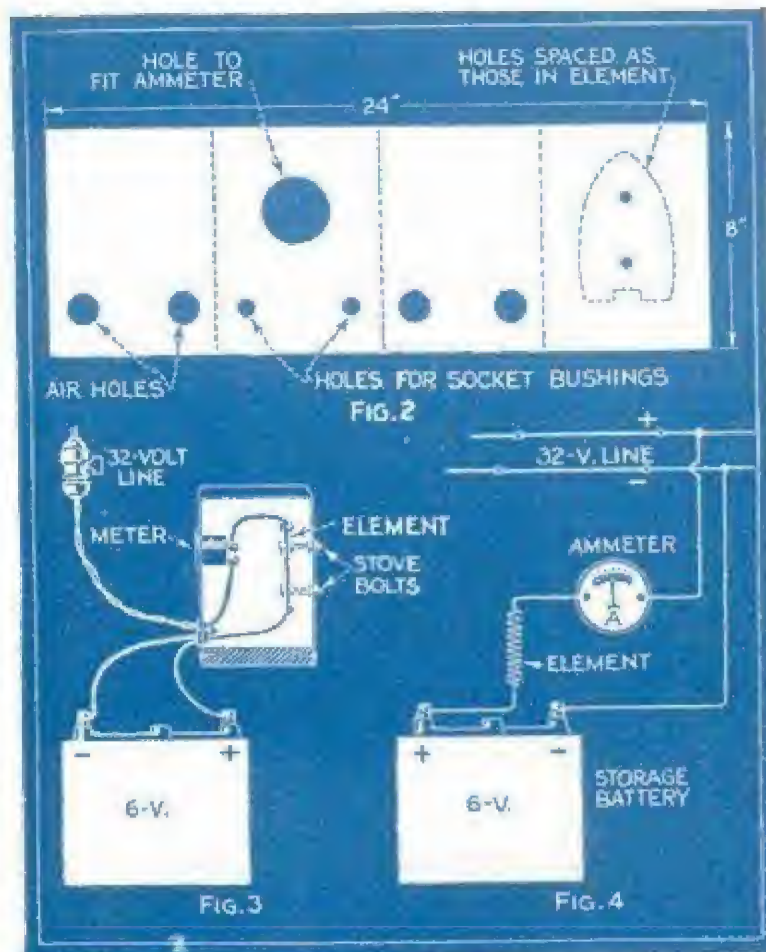
To make it easy for the home constructor, a resistance that can be readily obtained in the electrical shops is desirable. It was found that the element from a 110-volt electric iron, which can be bought for \$2 or less, met the required specifications, when connected as shown in the diagram. The element was inclosed in a neat sheet-iron box and an auto-type ammeter gives the completed unit a factory-built appearance. The base-

so that it will show the flow of current in either direction. If it is marked "charge-discharge," these indications may be disregarded.

The two lower terminal lugs on the heating element are connected with a wire or strip of metal, as shown in the detailed illustration; from this

point an insulated lead wire is brought out through a rubber bushing, in the front of the case, to a battery clip. This terminal will be positive, as shown in Fig. 4 in the blueprint diagram, so mark this clip with

Radio-Battery Charger for Farm-Lighting Plant; Broken-Out Section Shows the Instruments in Position and the Wiring



Above, Construction Details of the Sheet-Iron Box; Below, Wiring Details of the Completed Installation

a cross. The upper terminal of the resistance unit is connected to a short lead of insulated wire and goes to one side of the ammeter; the other terminal of the ammeter is connected to an insulated lead that is taken to one side of the 32-volt socket. The other socket lead is carried through the rubber bushings in the case and out to the negative A-battery clip; the details are clearly shown in Figs. 3 and 4.

Screw one part of the detachable plug into the light socket; the instrument must now be tested for correct polarity with the supply line. Connect the clips to the proper posts on the storage battery to be charged; while watching the ammeter, short the prongs of the plug with a piece of metal and note in which direction the pointer swings. If to the right, then it must swing to the left when the plug is connected in the socket and the 32-volt current turned on. Should it swing to the same side that it did on the shorting test, pull out the plug and insert the pins in opposite holes, reversing it. Shorting the plug in this manner will not harm anything, as the resistance is in series. Connecting the plug in the wrong direction momentarily, will not matter for the same reason. The main point to remember is

that, to charge the battery, the indicator must swing in the opposite direction to that in which it swings when shorting the pins of the detachable plug.

Poor Insulation Is Cause of Leakage

To really appreciate the chances for losing the energy picked up by the aerial before it reaches the set, and in the set before it can be built up to the point required for phone or loud-speaker volume, it is necessary to know something of the minute and feeble character of these impulses. The amount of energy picked up from distant stations by the aerial is so small that very delicate instruments are needed to detect its presence. It is the function of the radio receiver to amplify this minute energy and convert it into mechanical power sufficient to actuate the diaphragm of the phones or horn. It must be nursed and guarded so that it will flow along the path by which it is to be built up. To lose any part of it will lessen the volume of the receiver and cause loss of selectivity.

Good insulation through the set is necessary to cut these losses to a minimum. The instruments themselves must be of the correct design to prevent loss; in fact, for best results, it is necessary to go almost to extremes in preventing this energy to escape. Radio currents have a tendency to travel on the surface of the conductors and insulators, so that the presence of a little dust or moisture will offer a path for escape. Wood, therefore, is a poor insulator, as is any material capable of absorbing moisture. Many times wood subpanels coated with a black paint or finish, which invariably contains carbon in some form, are used, giving the minute currents a chance to escape. There are plenty of good, cheap insulating materials for panels and subpanels, and these should be used. Sockets of the "mud" type have almost disappeared from the market; this compound contained conductive material causing serious losses. Good sockets are now made of high-grade insulating materials, and are so designed that losses are reduced to a minimum.

Audio-frequency transformers should be mounted at right angles to each other, and 4 to 5 in. apart.

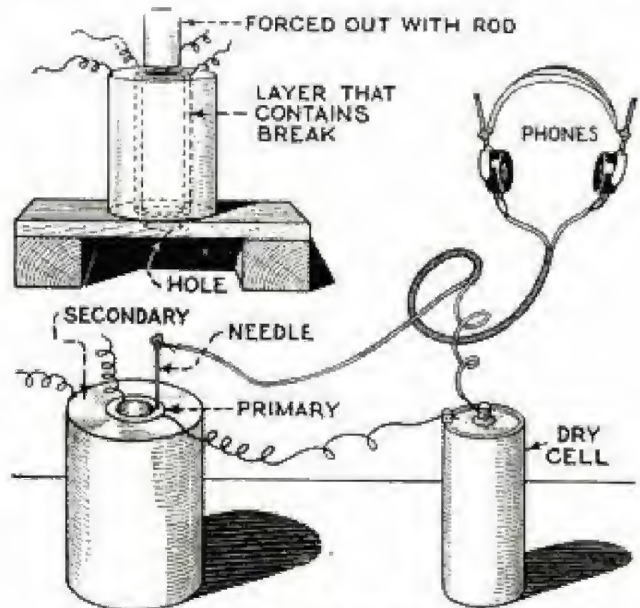
Finding Weak Tubes in Radio Sets

Many fans seem to think that they must be equipped with an accurate tester to locate troublesome tubes in their radio outfits or tubes that are in need of renewal for proper emission. A practical method that has been used for some time, is the following: Obtain a new tube as an extra in case of trouble. Remove the second amplifier tube from its socket and, with the switch cut in, move each tube up one position and note the amplification or tone value it gives. It will not take long to locate the tube which should be reactivated. A tube rejuvenator is the only investment needed, and the cost of an extra tube is of little consequence.

Repairing Audio-Transformers

A defective audio transformer is generally remedied by substituting a new one, although the trouble could be located in the old transformer. It is discarded because the fan has an idea that all the wire in it is ruined, or he does not care to tackle the "miles" of fine wire. However, very few feet of the wire have to be tampered with to locate the break. The trouble in most cases lies in the primary and nine times out of ten not in the winding actually burning out; and as by far the most transformers now in use are the layer-wound paraffin-paper type, it is not difficult to locate the break and repair it. The first thing to do is to remove the core, leaving the primary and secondary windings intact. A simple way to locate the break is to connect one end of a wire to a small needle, and the other end to a dry cell through a pair of headphones, the other post of the dry cell being connected to the winding to be examined. The needle is then slowly forced into the end of the winding; if a click is heard when the point of the needle touches the layer of wire, the wire is unbroken that far. By continuing to push the needle farther in until no click is heard, the exact layer that contains the break can be located. If it happens to be near the outside of the secondary, or the inside of the primary, it can be repaired without much trouble. If it is near the center, it will be necessary to heat the windings so as to soften the paraffin and force these windings apart at the break. This is done as illustrated in the upper left-hand diagram. A small wood platform with a hole in it slightly larger than the defective layer is prepared, and the heated coil is placed over this hole. A

cylindrical object that will fit the hole is then placed on the other end of the coil, and force is evenly applied until the windings are telescoped apart.



Locating Breaks in Defective Audio Transformers with Headphones in Series with a Dry Cell

When repairing the break, use only rosin for a soldering flux, and in replacing the windings, take care to keep the wire from breaking. If half a layer or so of the coil is lost, it will make no difference in the operation of the transformer. While rebuilding the core, if any trouble is experienced in getting all the laminations in place, try squeezing those that are assembled and then adding more to them.—Watson Brown, Iuka, Miss.

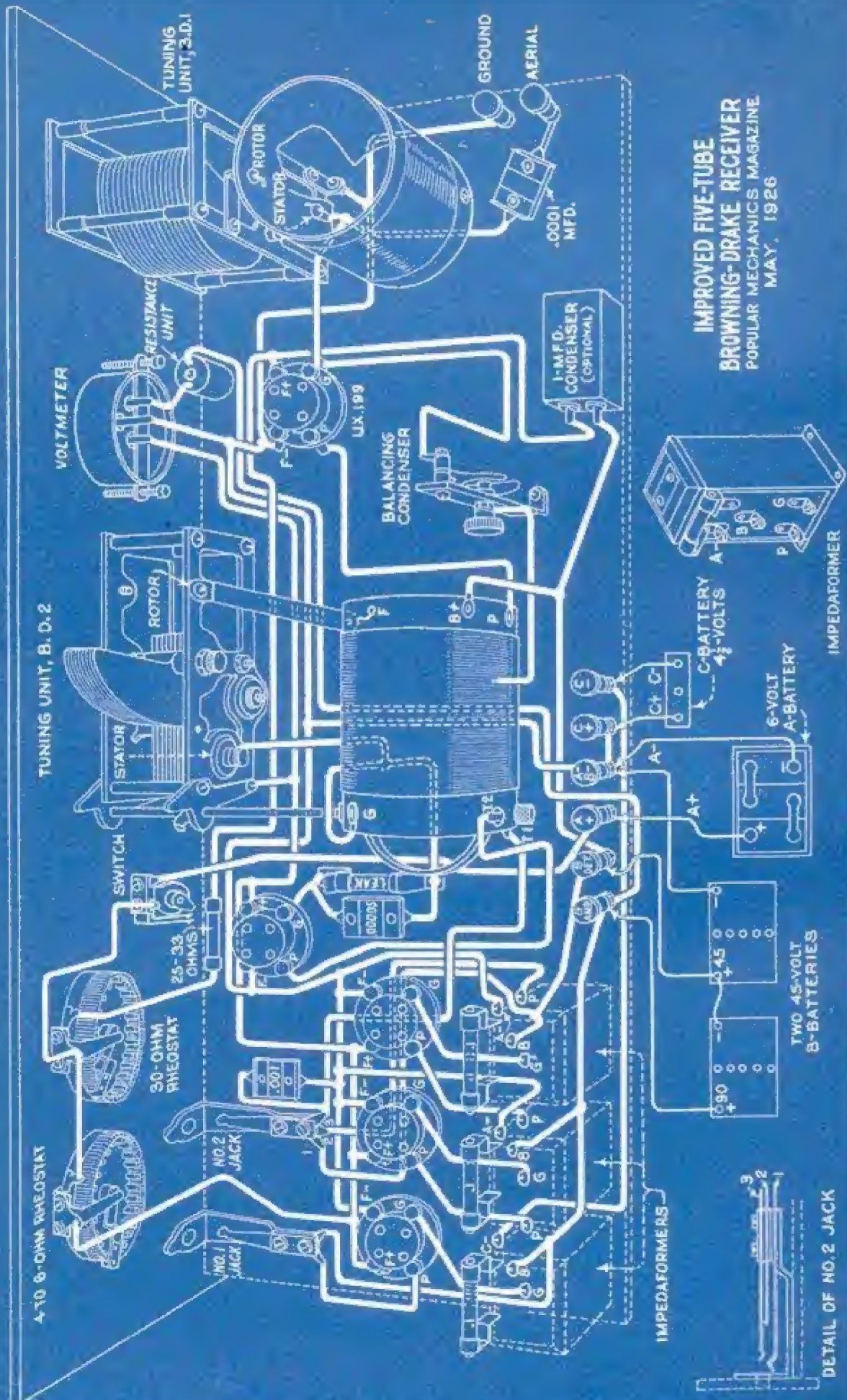
Low-Rate Charger for Continuous A-Battery Supply

A low-rate charger designed for continuous charging over long periods of time is especially designed for dry-cell sets and storage-battery sets having relatively few tubes. The instrument charges both 4 and 6-volt



A-batteries at about .5 ampere, and requires very little attention. Operating directions accompany each charger, giving time of operation necessary for the various types of sets. The charger can be so regulated that it can be left on continuous charge, if desired, thus keeping the A-battery up to full charge all the time.

Philadelphia Storage Battery Co., Philadelphia



IMPROVED FIVE-TUBE
BROWNING-DRAKE RECEIVER
POPULAR MECHANICS MAGAZINE
MAY, 1926

Five-Tube Browning-Drake Receiver of Improved Design

By GLENN H. BROWNING, c/o

*National Cashmere
110 Brookline St
Cambridge
Mass.*

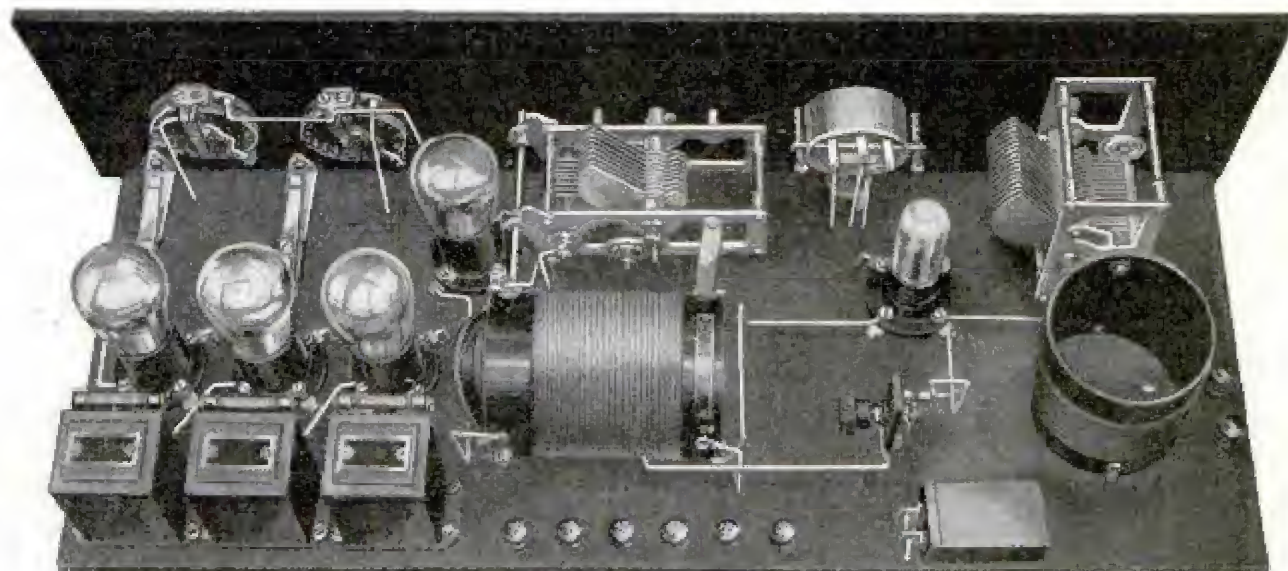
EVERY broadcast listener desires a radio set which is at the same time sufficiently sensitive to receive distant stations and selective enough to cut out interference and easily separate local stations. The signals received must also have good tone quality. If, combined with these qualities, the receiver is easily built and operated, it is most welcome to the listener. The receiver to be described is selective, sensitive and easily built and, while not perfect, is believed to be a step in the right direction.

The circuit is a combination of old and new ideas, and depends for its efficiency largely on the design of the tuned r.f. transformer used. This 1926 model of the well-known circuit also employs straight-line-frequency condensers, dials of new type, and a very efficient method of impedance-coupled audio amplification. The problems involved were worked out by the writer and Frederick H. Drake, at Cruft laboratory, Harvard university. The particular problem solved was the design of a tuned r.f. transformer, which would give the greatest possible amplification when employed with the tubes now obtainable, the result being, that approximately 90 per cent of the amplification calculated by mathematics was obtained in practice. In this circuit the tuned r.f. transformer is used with a regenerative detector, so that one stage of radio amplification suffices for all purposes.

The reader should understand that the purpose of a r.f. amplifier is to build up feeble signals so that distant stations may

be received. There is a limit, however, to the sensitivity of any receiver, for noise such as static and "man-made" interference, may be louder than the incoming signals from a very distant station. Then, no matter how sensitive the set may be, only a limited distance can be received before what is known as the static or noise level is reached. Thus, if we have a set which will receive signals up to this level, its sensitivity has reached the practical limit. In the quest for an efficient audio amplifier to combine with the r.f. part of the receiver, laboratory measurements were made on three possible choices, namely, two stages of transformer-coupled audio, three stages resistance-coupled, and three stages of the impedance-coupled type. The latter was finally chosen, for, although it requires three tubes instead of two, only 90 volts of B-battery are needed, and the quality of the received signals is practically perfect. When tested in Popular Mechanics radio laboratory, this receiver had unusually good tone and range.

The layout of the receiver is very simple. The UX-199 tube is placed between the two tuning units, and the audio amplifier at the right of the detector, making the leads short, especially those carrying the r.f. currents. The front panel is $\frac{3}{16}$ by 7 by 24 in.; the subpanel, $\frac{3}{16}$ by $8\frac{1}{2}$ by 23 in. They should be of bakelite or formica, although the subpanel may be of $\frac{1}{8}$ in. wood if desired. Mount the instruments on the front panel first, as shown in the front-view photo. Lay out

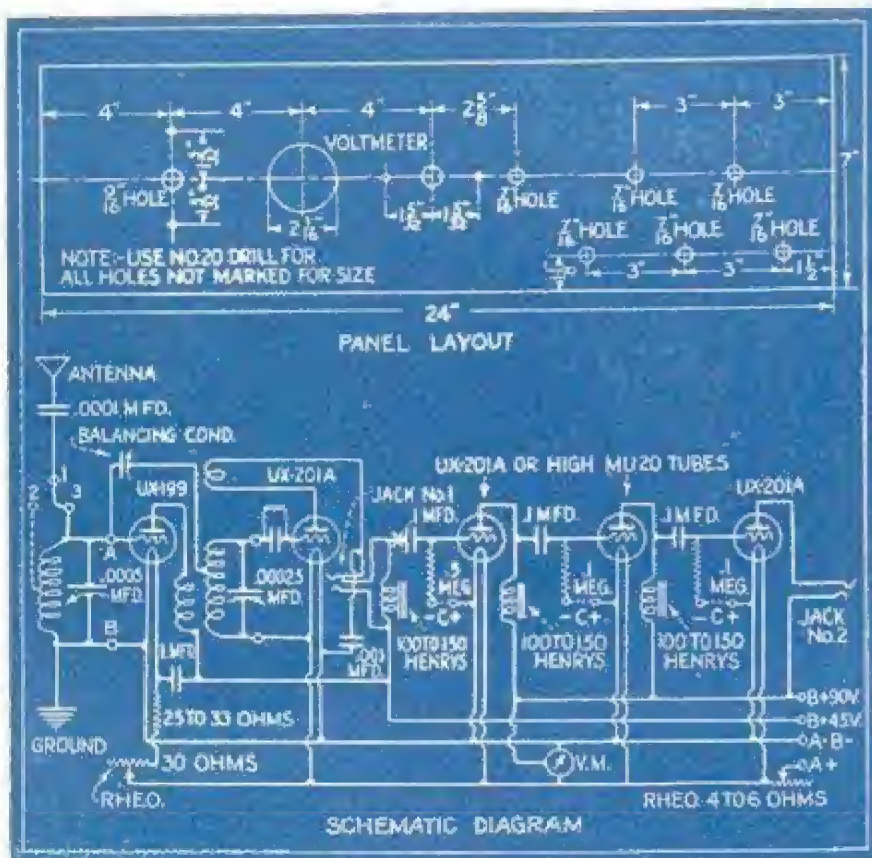


Rear View of Completed Set, Showing the Method of Running the Wires above the Subpanel
Copyright, 1926, Popular Mechanics Magazine

the instruments on the subpanel as shown in the rear-view photo of the completed instrument and the full-page blueprint diagram. It will be noted that the brackets on the first tuning-unit condenser support one side of the subpanel, while the

above and below. Black-spaghetti tubing is slipped on the leads where necessary to prevent shorts. The schematic diagram is given for those who prefer it to the simplified wiring diagram.

It was found, with either a resistance or impedance amplifier, that the r.f. current entered the a.f. circuit and affected the operation of the receiver slightly, sometimes giving a popping noise in the loud speaker when the tickler coil was advanced too far. This was eliminated with a choke coil placed in series with the .1-mfd. condenser at the point marked X on the schematic diagram, and must be used if any other type of amplifier than that specified in the material list is employed. These impedance transformers contain a choke coil and .1-mfd. condenser, and the entire unit is employed in much the same manner as an ordinary a.f. transformer. Connections for the C-battery are shown in the large blueprint diagram. This C-battery is for the last audio stage and can be varied to suit



Above, Front-Panel Drilling Template; Below, Schematic Wiring Diagram

other end is screwed to the frame of the No. 2 jack. Brass machine screws, or inverted binding posts, can be fitted to support the rear edge of the subpanel. The wiring diagram is given in simple detail on the blueprint page, all of the wiring being shown above the subpanel so that the various leads can be easily traced. When wiring the set, however, it is best to run the leads under the subpanel whenever convenient. The rear-view photo and the underpanel view show the leads both

the type of tube used. The new UX-type sockets, suitable for either the 199 or 201A tubes, are used throughout the set. The detector and amplifier tubes are the 201A-type; HI-MU tubes can be used in the amplifier stages if desired. If a power tube is desired in the last stage, it is necessary to provide an extra binding post for the required 135 volts. The 1-mfd. condenser, marked "optional," may be omitted in almost all cases where the leads to the B-battery are short, and

MATERIAL LIST

- | | |
|--|---|
| 1 bakelite or formica subpanel, 3-16 by 8½ by 23 in. | 1 type 17 double-range Hoyt voltmeter. |
| 1 bakelite or formica panel, 3-16 by 7 by 24 in. | 1 fixed mica condenser, .0001-mfd. |
| 1 National tuning unit, Browning-Drake 1-Type-B. | 1 fixed mica condenser, .001-mfd. |
| 1 National tuning unit, Browning-Drake 2-Type-B. | 1 fixed mica condenser, .00005-mfd. |
| 1 Yaxley (or similar type) 30-ohm rheostat. | 1 gridleak (try from 5 to 8 meg.). |
| 1 Yaxley (or similar type) 6-ohm rheostat. | 1 gridleak mounting. |
| 1 Yaxley (or similar type) switch. | 3 National impedance transformers (these combine an impedance, .1-mfd. fixed condenser and gridleak). |
| 1 Rathbun, General Radio, or X-L, balancing condenser. | 10 binding posts. |
| 5 General Radio UX sockets. | 1 fixed condenser, 1 mfd., (optional). |
| 1 Yaxley (or similar type) double-circuit jack. | 1 UX-199 tube. |
| 1 Yaxley (or similar type) single-circuit jack. | 4 UX-201A tubes. |
| 1 fixed-resistance unit, 25 to 33 ohms. | |

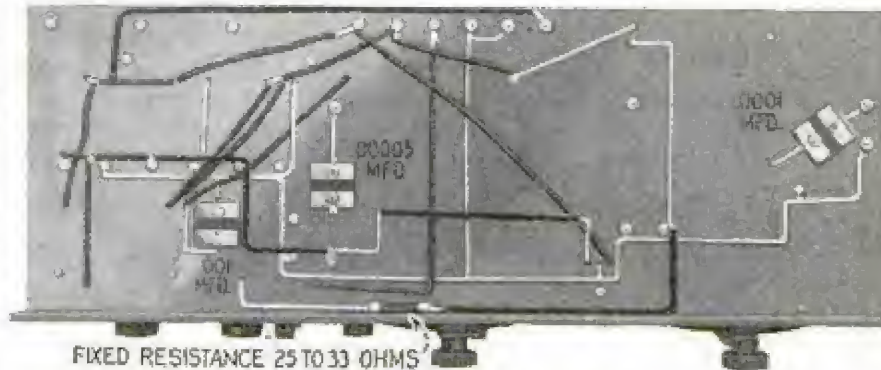
whether or not it helps in balancing the receiver, can only be determined by experimenting. The UX-199 tube is used as a r.f. amplifier, as it is much easier to balance than the 201A-type, and gives approximately the same results. The 33-ohm resistor in series with the filament line reduces the 5 volts across the large tubes to 3 volts for the filament of the small tube, so that the 30-ohm rheostat may be turned full on when maximum signal strength is desired. This rheostat can be used as a volume control so that local-station strength can be reduced as desired.

A very short aerial, say, from 10 to 70 ft. including the lead-in, may be erected for the receiver, and the shorter the aerial the better the selectivity. The aerial should be as high as possible, the writer having used a vertical stretch of about 30 ft. with good effect. A short aerial should be connected as shown in the large wiring diagram, and, if the longer aerial is used, a tap should be made from the aerial coil to a separate binding post and the long aerial connected to this post. This arrangement, which is shown at point 2 in the schematic diagram, keeps the dial readings more nearly together.

The set may be adapted to a loop by disconnecting the first coil from the condenser and connecting the loop to points A and B, as shown in the schematic diagram. However, a short aerial has more pick-up, although stations 1,000 miles away have been received under favorable conditions on the loud speaker with a small loop. In fact, the writer has

erly built and skillfully operated, but the builder should not expect to get distant stations the first night.

When the set has been constructed, the first thing to do is to balance it so that it will not reradiate. Connect the aerial, ground and batteries, and place the tubes



Under-Subpanel View, Showing the Fixed Condensers in Position

in the sockets. Plug in the phones in the first jack, and tune in a local station with the two dials and the rotor, or "tickler" coil. Then turn the 30-ohm rheostat off, leaving the UX-199 tube in the socket; set the balancing condenser so that the local station is heard very faintly if at all. When this condition is reached, rotating the first dial should have very little effect on the signal strength. This is all done with the 30-ohm rheostat turned off. This finishes the operation of balancing the receiver, and the rheostat can be turned completely on again.

In locating stations for the first time, it is easiest to turn the tickler knob to a point where putting a finger on the stator plates of the second condenser gives a click in the loud speaker, and rotating the dial of this condenser should give a whistle when a station within range is transmitting. Turn back the tickler until the whistle disappears and adjust the aerial tuning condenser to the point where the station is loudest.

Blueprints for this set, including full-size drilling template and enlarged wiring diagram, may be obtained from the Radio department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago.

Include 15 cents to cover postage and packing. Specify blueprint No. 108.



Front View of Instrument Panel

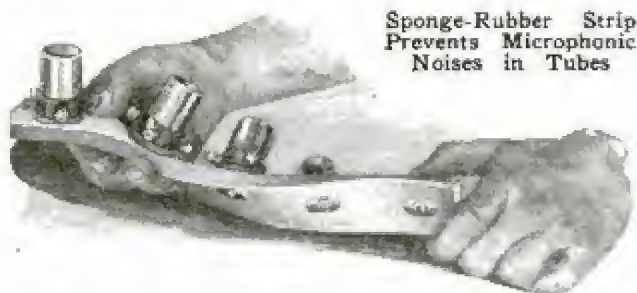
heard, on a friend's set, a station 400 miles away with no antenna connection at all. This is very unusual, however. For extremely sharp tuning it is suggested that the aerial lead be disconnected from the set under crowded conditions in large cities, when local programs are desired. The set is capable of bringing in stations several thousand miles away when prop-

By filing the ground wire flat before soldering it to a water pipe, and by soldering the antenna-wire tip into a copper lug, the contact surface of both will be enlarged, and this has been found to increase the efficiency of some sets.

*Electrical Engineering
Equipment Co.
708 W. Madison
Chicago*

Cushioning Radio Tubes

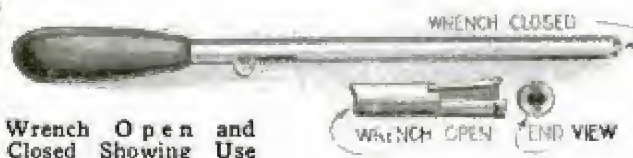
Microphonic rings are quite common in many radio sets where the sockets are rigidly mounted on the subpanel. Every



jar in the room is readily transmitted to the tubes and causes distortion in tone. A good remedy for this trouble is a strip of sponge rubber, with the tube sockets mounted on it as shown in the photo. The sockets are fastened by means of screws projecting through both the base and the cushion. The screws are turned up quite tight so that the nuts and washers are pulled up below the underside of the cushion. Glue is then used to fasten the cushion to the baseboard.

Adjustable Radio Socket Wrench

Tightening nuts on the various instruments of a radio set is sometimes rather difficult especially if attempted with a pair of pliers. To overcome this trouble socket wrenches have been put on the market. One, which has been found especially useful, is shown in the illustration. It has adjustable jaws designed to fit many different sizes of nuts. By pulling a thumb adjustment backward the jaws are tightened on the nut, whether this is of the hexagon or the knurled type. The work is done entirely with the hand hold-



ing the wrench. As it is nearly 10 in. long, it can be used to reach nuts which are otherwise inaccessible.

Magnetic Coupling of Parts Prevents Good Reception

The intercoupling of the magnetic fields of the various instruments in the radio receiver is one of the main causes of unstable operation, and distorting music or

speech. Faulty wiring, careless soldering and defective instruments also come in for a fair share of the blame.

Other forms of trouble are easily located, but the invisible fields are more difficult to find. These fields are like halos around the coils, condensers and other pieces of apparatus, and must be diverted either by shielding the instruments or by placing them at critical angles, so that the fields will interact as little as possible. This is often a hard matter for the radio builder to do, so instrument designers have produced coils of the toroid, or "doughnut," type and the binocular form in which the field is confined to the coil. Shielded or "canned" coils and condensers are also available. Grounded shields between the tubes and other apparatus also tend to lessen this troublesome intercoupling.

702-22

Rheostat for Critical Filament Control

A rheostat of unusual design, for critical filament control, has lately made its appearance on the market. The resistance is varied by winding a wire from a short-circuiting cylinder onto an insulating cylinder, or vice versa. The cylinders have a positive gear drive, and the wire is kept taut by means of a torsion spring. It is claimed that the minimum resistance of the rheostat is less than .2-ohm. Twenty-four complete turns of the knob are necessary for varying the resistance from minimum to maximum, giving a very fine micrometer adjustment. These rheostats are made in resistances of 6, 15 and 30 ohms.



Hydrometer Only Reliable Tester of Storage Battery

The best check on the condition of a storage battery is obtained with a hydrometer. A voltmeter does not give a true reading of the condition of the battery, as a practically dead storage battery will show a 6-volt pressure. A fully charged battery will give a hydrometer (specific-gravity) reading of between 1.300 and 1.285; the half-discharged battery reading 1.200, and a completely dead one 1.100. Never permit the battery reading to fall below 1.200.

*William Schollhorn
414 Chapel St.
New Haven Conn.
Cor 719-2*

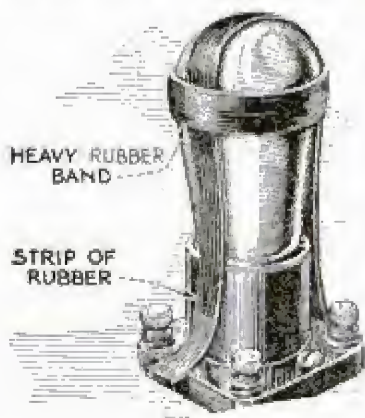
Simple Method of Rejuvenating Tubes

Tubes that have lost their ability to give good reception can be restored almost to their former usefulness by the process of rejuvenation. This consists in applying alternating current to the filament at comparatively high voltage for some seconds, and finishing off with about 8 volts for about ten minutes. If the manufactured unit for this purpose is not available, a homemade device can be rigged up that will accomplish the same results. A bell-ringing transformer of the type having taps for 6, 8 and 14 volts is required; this is connected to the 110-volt a.c. supply line, and the output taken to the filament posts of a tube socket. First determine if your tubes are of the type that can be rejuvenated; if they are of the UV-201A or C-301A types, it is safe to proceed, but do not attempt to rejuvenate other types.

Place the tube in the socket and first apply the full 14 volts for 30 seconds, then keep the tube lighted with 8 volts for ten minutes. These may seem to be excessive voltages, but the tubes will stand them if the transformer is not defective and alternating current is used as directed. It is possible that the tube will burn out under this treatment, but it rarely happens if proper care is taken.

Rubber Bands Help Reduce Microphonic Tube Noises

Owners of radio sets who are troubled with a tube which has become microphonic and produces harsh ringing noises when the set is jarred, can reduce the



noises somewhat by using rubber bands as indicated in the sketch. Cut a long, wide and soft rubber band apart, and drape it over the dome of the tube, allowing the ends to trail on the base of the socket. Then

stretch a shorter band around the bulge of the tube so it will hold the first band securely in position. This arrangement tends to reduce the vibrations imparted to the glass itself, and will be found a help, especially with a tube that is doing good work otherwise.

Hidden Mat-Type Aerial Saves Space

An efficient mat-type of aerial that takes up very little space is illustrated in the ac-



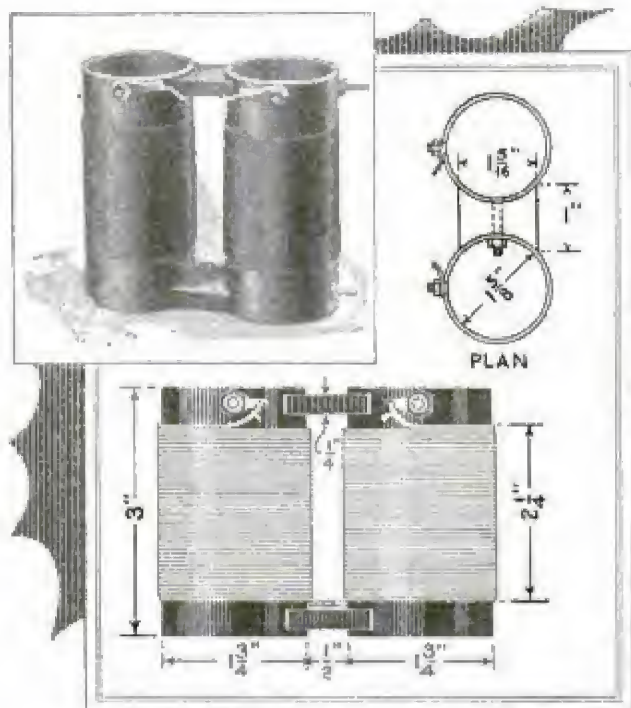
Mat Type of Aerial. Showing How the Wires Are Laid; Inserts Show Various Ways of Using It

companying drawing. The upper-left part shows the aerial partly rolled up, with a section cut away disclosing the wires. The metal strip along the lower edge forms a condenser, and the binding post for the connection to the set is shown in the center of this strip. An aerial of this type can be used in many different ways. It may be suspended in the attic and connected to the aerial post of the set in the usual manner, or spread under the rug, either as an aerial or as a counterpoise. It may also be used rolled up, in which position it is said to be very selective, and as satisfactory as a loop aerial. It is available in 3 by 10-ft. and 3 by 6-ft. sizes. In localities where space is at a premium an aerial of this type minimizes reradiation, and saves roof installations. The fact that it can be hidden is of interest to those who wish to keep as much apparatus as possible out of sight.

Ⓐ new upright B-battery, made specially for portable sets, is $3\frac{1}{4}$ in. long, $2\frac{3}{4}$ in. wide, and $5\frac{3}{8}$ in. high. It has 50 per cent more capacity than the common portable size and weighs only $2\frac{1}{2}$ pounds.

Building "Binocular" Coils

So-called binocular coils are easier to build than coils of the toroidal or doughnut type, and are ideal for radio-frequency sets. These coils possess the same desir-



Completed Binocular-Coil Unit, and Right, Section Showing Mounting Screws in Position; Below, Details of Wiring and Construction

able characteristics, electrically, as the toroidal coils. The insert photo above shows the secondary of a homemade coil of this type. The construction is very simple; two bakelite tubes of $1\frac{3}{4}$ -in. external diameter are used for each coil, the walls being $\frac{1}{8}$ in. thick and the length of each tube 3 in. They are wound with No. 22 d.s.c. wire as shown in the lower diagram.

When used with .00025-mfd. condensers, 75 turns of wire are wound on each coil, making 150 turns for the pair. The winding occupies $2\frac{1}{4}$ in. and there are 33 turns to the inch. Of the two coils one is wound clockwise and the other counterclockwise. If .00035-mfd. condensers are used, the number of turns is reduced to 60 for each coil. The winding will occupy $1\frac{3}{8}$ in. on the tube.

After the coils have been wound and the ends of the wire anchored by looping them through small holes, the tubes are assembled, as shown in the lower illustration, by means of two small bakelite spacers, $\frac{1}{4}$ in. thick, that can be sawed out with a small coping saw. When doing this the bakelite should be clamped to a thin board so that it will not chip. Two small flat-headed brass machine screws

finish the assembly. The two coils are then joined as shown in the plan. This completes the secondary of the unit.

The primary is then wound on a slightly smaller tube having an outside diameter of $1\frac{1}{4}$ in. It is space-wound with 29 to 30 turns of No. 32 d.s.c. wire, and then slipped inside one of the pair of secondary coils. Choose the one in which the brass connecting screw is countersunk, so as to permit the smaller tube to slip inside freely.

If desired this primary coil may be moved in or out to obtain a tighter or looser coupling, which is necessary to assure selectivity and prevent oscillation.

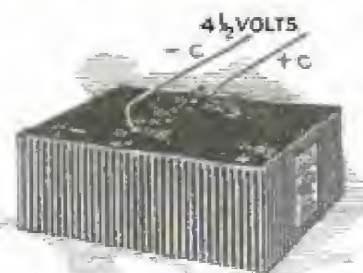
Handle Phones with Care

Headphones should be handled as carefully as a fine watch. When correctly built they are delicate instruments and will not stand rough usage. One should never let them drop on the table or floor, nor permit the cords to become twisted, as the tinsel conductor in them is easily broken. See that the terminals are tight, and do not leave phones where they are exposed to dampness, or on a workbench where metal filings are scattered about.

Making the B-Battery Do Double Duty

There are some tricks in the use of batteries with radio receivers which have a decided bearing on operating costs. As is now well known, a C-battery must be used in all sets employing two stages of a.f. amplification, that is, if the B-battery current is to be conserved. When $4\frac{1}{2}$ volts are required for this C-battery, it is not necessary to purchase a separate unit for this purpose. If the reader will carefully inspect the sketch attached, a simple method of securing the effect of a C-battery will be shown clearly.

Most sets have a $22\frac{1}{2}$ -volt B-battery in the circuit, as all do not use the heavy-duty batteries. Attach the positive C-lead from the set to the $22\frac{1}{2}$ -volt post on the battery and the negative C-lead from the set to the $18\frac{1}{2}$ -volt post on the B-battery. It will readily be seen that the $18\frac{1}{2}$ -volt post with this arrangement really becomes a negative terminal.—L. H. Georger, Buffalo, N. Y.





Preventing Oscillation to Improve Radio Reception

By F. L. BRITTIN

GOOD control is necessary in operating any type of radio receiver, and without this good results are impossible. Better control means clearer signals, and makes possible long-distance reception. A set that is "touchy" and inclined to break into squeals is a set that is hard to tune; uncontrollable oscillations of this type really mean that the set has ceased to be a receiver and has become a transmitter. There is a very close relationship between the receiver and transmitter. Some receivers can actually be used as transmitters of code signals by simply substituting a telegraph key for the headphones or horn, and all that is necessary to cover surprising distances with such a transmitter is to increase the plate voltage.

A well-known type of simple receiver is shown in Fig. 1; note the few changes necessary to convert this receiver into an efficient transmitter, as shown in Fig. 2. This simply means that when your set is allowed to squeal and howl you do not have an equal chance for good results with the man who operates his set with greater skill.

The trouble may not lie altogether with the operator, however, as the set may not be designed correctly. It may need better balancing, and this can be done with neutralizing condensers, potentiometers, the addition of a stage or so of r.f. amplification, or by various other methods which add greatly to the tone, selectivity and range of the receiver.

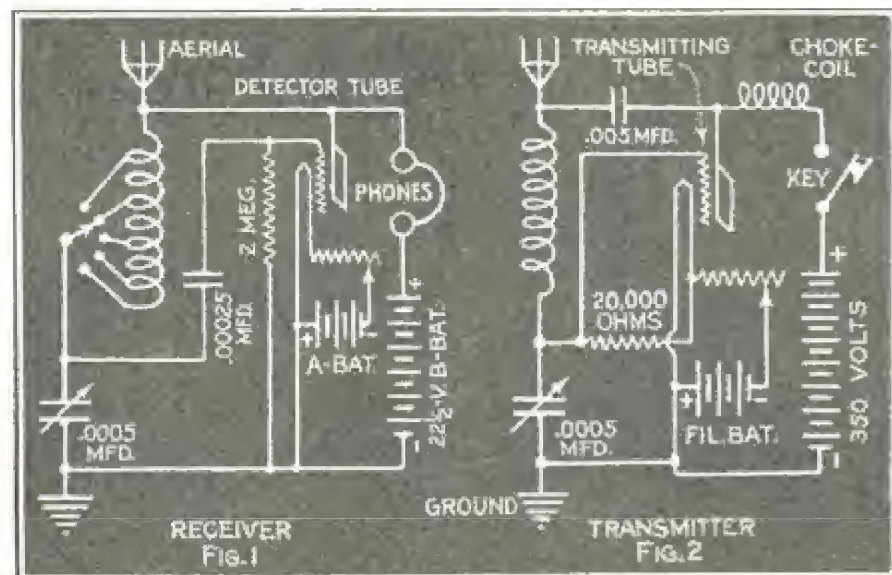
If you do not care to make changes in your set to prevent such a condition, tune the set carefully so as to reduce this interference to a minimum. This can be done by avoiding the position your controls are in when your



set is whistling or oscillating. It is easy to tell when the whistle is caused by your own set, as then, leaving the regeneration control alone and rotating the tuning dial

suaude your neighbor who has a similar offender, to do the same, the quicker you will realize how good your set is on distance, if it has a chance to do its best.

The unit can be built up on a small panel and baseboard. The coils are homemade and No. 26 d.c.c. wire is used for all. The coil which is connected to the aerial and ground is wound on a $2\frac{3}{4}$ -in. length of 3-in. tubing. Start $\frac{1}{2}$ in. from the end and wind 15 turns, take off a tap and continue the winding for 50 more turns; this completes the first coil. On a 4-in. length of 3-in. tubing, starting $\frac{1}{2}$ in. from the end, wind 30 double turns. To do this, it is necessary to use two lengths of wire, winding them side by

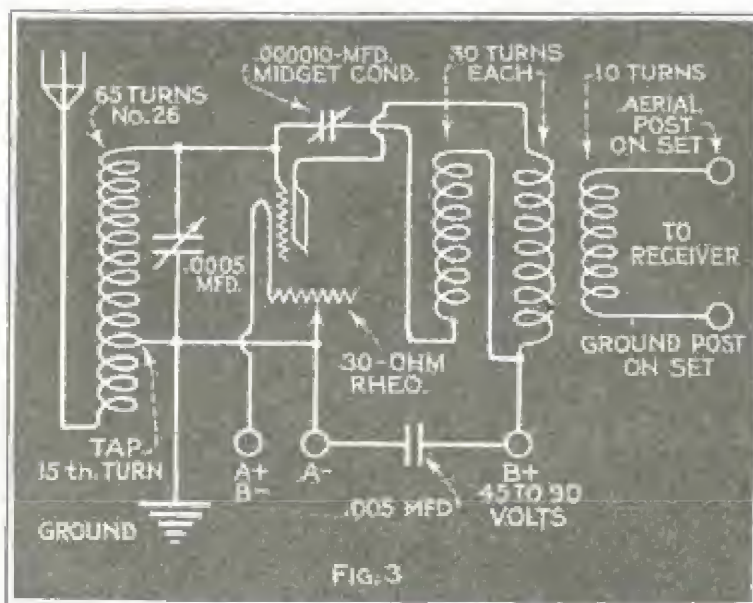


The Close Relationship between Transmitters and Receivers, and the Few Changes Necessary to Turn One into the Other

will cause the whistle to rise and fall in pitch. If two stations are broadcasting on similar wavelengths, they will often cause the set to whistle; if the whistle does not change pitch when the tuning dial is rotated, but merely varies in volume, the trouble is not in your set. Keep the filament supply to the tubes reduced to the lowest point consistent with clear signals and good volume. Turning up the tubes beyond this point will often cause the set to break into oscillation, and also tends to shorten the life of the tubes. Most sets have a control marked either regeneration, tickler, volume or sensitivity; when this control is turned too far over, the set breaks into oscillation and becomes a miniature transmitter sending out waves, and the length of these waves is changed every time you change the position of the tuning dial.

One of the best methods of obtaining better results, and at the same time adding to the range and selectivity of the set is to construct a non-radiating unit that can be attached to almost any type of receiver. A good example of this type of apparatus is the unit shown in Fig. 3. It consists of a few simple coils and condensers and an extra tube, and can be built for about \$15. After you have learned that your set is a squealer, the sooner you build the unit and per-

side at the same time, making a double coil 60 turns in total length when connected, 30 of which are in each of the two coils. Connect the end turn of one coil to the first turn of the other; at this point note that a lead is taken to the B-positive binding post. On this same tube, from 1 to $1\frac{3}{4}$ in. out from the double coil, wind the 10-turn coil to be connected to the receiver. Mount these coil units at right angles and space them 2 or 3 in.



A Simple Non-Radiating Unit That Can Be Added to Most Receivers, Improving Both Range and Selectivity

apart. Mount the 65-turn aerial coil in a horizontal position with the 15-turn end toward the outside edge of the baseboard

handy to the aerial post. The other unit is mounted in an upright position with the 10-turn coil at the top. The tube socket can be placed between the coils, and the rheostat and condensers are then mounted on the front panel. Arrange the binding posts on either side of this panel in positions handiest to the points to be connected. Fasten the coils to the baseboard with small brass brackets. The small neutralizing condenser can be mounted either on the baseboard or the panel. When connecting this unit to the receiving set, bring additional A-negative and A-positive leads from the corresponding posts on the receiver. It is assumed that the B-battery of the receiver totals from 45 to 90 volts. If the set uses a 22½-volt B-battery only, add more units to bring the total voltage up to from 45 to 90 volts, leaving the detector plate at 22½ as before. If the receiver is of the type using two or more tubes, the 90-volt B-battery is sufficient. Take the 90-volt B lead to the B-positive post on the unit. If there is a previous 90-volt connection on the receiving set, leave it as it is, and take an extra lead from this post to the B-positive post on the unit.

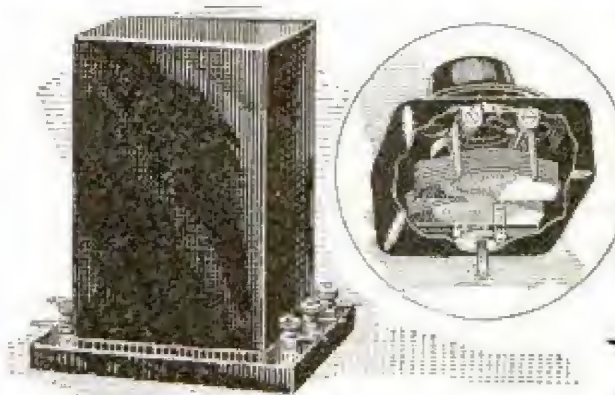
Connect the unit to the aerial and ground and to the aerial and ground posts on the receiver. Now the unit should be balanced. Light the tubes in both the unit and set, turning the tuning condenser of the unit to about 40. Increase the feedback, or volume control of the receiving set, until it oscillates, and tune the receiving set for a signal with its condenser. The signal will come in with the usual whistle; then turn the tuning condenser of the control unit for maximum volume. Vary the setting of the midjet condenser until, when turning the tuning condenser of the control unit through the maximum volume of the signal, the whistle is varied in volume but not in pitch. Leave the midjet condenser in this position. Tuning is then done with both the large condenser on the unit and the tuning controls on the receiver, adding selectivity and volume to the set.

Blueprints of the unit layout and wiring diagram, may be obtained from the Radio department, Popular Mechanics Magazine, 200 E. Ontario st., Chicago. Inclose 15 cents to cover postage and packing. Specify blueprint 109.

HOW TO PUT UP AN ATTIC AERIAL is the title of an informative article in the July, 1923, number of the magazine. This will be sent to any address upon receipt of 25 cents.

"Canned" Coils and Condensers

Shielded or "canned" coils and condensers are now on the market, saving



"Canned" Coil Reduces Pick-Up of Strong Local Stations; Insert, Details of Shielded Condenser

the experimenter the trouble of building his own. By shielding the condenser, effects of hand capacity are practically eliminated, dust or other foreign particles cannot accumulate between the plates, interfering with the tuning of the set, and the condenser is protected against magnetic spraying from other instruments. "Canning" of the coils confines their fields and reduces the pick-up of strong local signals by the coils themselves, besides allowing more compact construction, and eliminating the usual critical angle necessary with other r.f. coils. These advantages are especially important when r.f. amplification is employed.

\$5.00.

Compact Battery Eliminator

A compact A and B-eliminator is now available. Taps are provided for the various A and B-voltages and the unit is plugged into the 110-volt 60-cycle house-lighting circuit in the same manner as an electric iron, or any similar electrical device. The A-voltage taps are arranged so that tubes of

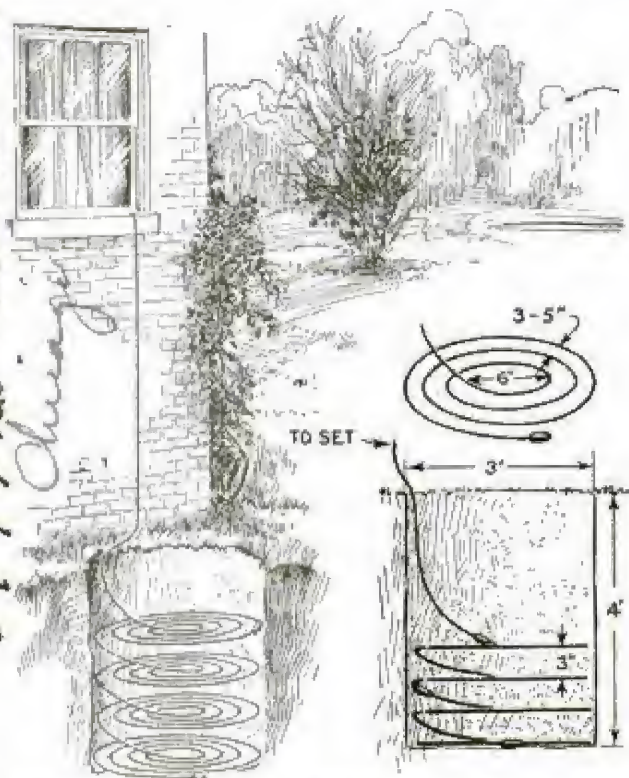


the low or high filament voltage types can be used. When the instrument is connected to the set, the filament switch on the set is left turned on, and the entire installation is turned on and off with a push-pull switch on the front panel.

Cooper Battery Corp.

679.05
Chicago
Canned Coils and Condensers
Cord - Cullen Radio Corp. 961 Milwaukee
Condenser - Rauland Mfg. Co. 265
Canning are

Annunzio, Ohio.



Details of Underground Antenna Installation, Showing the Method of Coiling Wire and Spacing Coils

Underground Antenna Improves Radio Reception

A specially designed underground antenna is claimed to eliminate all interference by using ground waves instead of the air waves because the former are believed to be practically free from atmospheric disturbances.

The installation of the ground antenna is very simple. The method shown in the illustration was used by Popular Mechanics radio laboratory with good results and is specified by the manufacturer. The antenna consists of shielded and sheathed wire with especially constructed pick-up coils at the end and center, and is available in either 75 or 100-ft. lengths. The pick-up coils transfer the energy or ground waves by induction, and the sheathing transfers its pick-up of energy by capacity, the shielded lead-in acting as a return for strays.

Locate a suitable spot of ground under the window nearest the radio set, and dig a hole 3 ft. or more deep, 2½ to 3 ft. in diameter. Start with the knob end of the antenna, winding in a clockwise direction to form a flat spiral coil. Working toward the center, keep the turns about 1 in. apart, until the space left in the center is about 6 in. across, as shown in the upper diagram. Cover this coil with about 3 in. of dirt, carrying the wire in a long sweep through this dirt to the side of the hole again; then lay another coil and

cover it in the same manner, continuing until four coils are made as shown. The 75-ft. length will leave a balance to be used as a lead-in. Five or six coils can be wound with the 100-ft. antenna. If the cellar floor is not cemented the installation can be made in the basement.

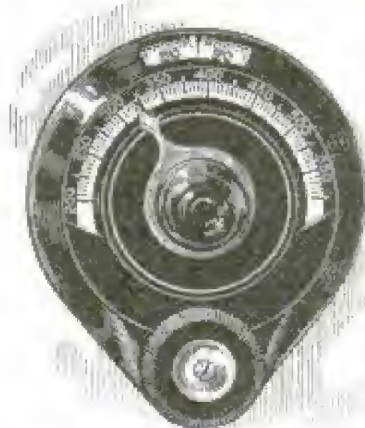
There are two other methods of installing this type of antenna, one, in a straight-line trench from 18 in. to 2 ft. deep, and another in a trench of the same depth, but in the shape of the letter "S." The method illustrated is best, however, as the spiral form is non-directional.

New Dial Gives Readings

676Q in Wavelengths

A new dial for locating stations by wavelength readings as well as the usual method is now available. The dial is calibrated both ways from zero, so that either right or left-hand condensers can be used. This reading is shown through the window at the upper edge of the dial; the wavelength divisions are shown on the chart at front, and an adjustable pointer, which can be set to indicate the various wavelengths, also turns with the condenser shaft. An accurate wavelength reading on the chart can be obtained if the condenser and coil used are of suitable types; if not, the chart can be reversed, offering a blank surface for calibration for the condensers and coils used. If desired, the call letters of the stations can be inscribed

on the chart. If the coil and condenser specified by the maker are used, a station is tuned in with the condenser plates about halfway out, the wavelength of the station is then looked up, and the large pointer is ad-



justed with a setscrew to that wavelength on the chart; the straight-line wavelength condenser will then show the corresponding wavelength on the chart.

¶ A standard 50-ohm resistance coil, originally supplied with a bulb charger for charging B-batteries, when connected in series with a neutrodyne receiver and a 100-volt storage battery, has been found by a reader to produce increased volume and purer tone.

Suburban Corp. 928 Clinton Chicago

Claverleaf Mfg. Co. 2714 S Canal St. Chicago

Warner - Kelly Mfg Co. 532 S Canal



Cigar Humidor from Dime-Store Parts

By J. EARLE MILLER

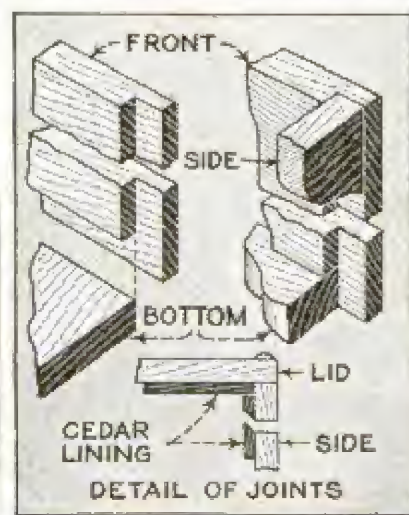
A CIGAR humidor, built, with the exception of the cedar lining and a small piece of brass, from parts purchased in a ten-cent store, offers an attractive and easily made ornament for the amateur whose tools and working space are limited.

Even the oak for the box was obtained, ready planed, from the dime store by purchasing parts for the knockdown radio cabinets sold there, and resawing them to the required dimensions. The actual size of the box was dictated more or less by the size of the radio-cabinet parts, but with an inside depth of $4\frac{1}{2}$ in., a length of 8 in. and a breadth inside of $4\frac{1}{16}$ in., it is large enough to take 100 average-size cigars.

Fitting and assembling are simplified by building the box as one solid unit, and then sawing it apart to form the bottom and lid sections. The radio cabinet parts furnished two pieces, $9\frac{1}{8}$ by $5\frac{1}{16}$ in., for the front and back, and two pieces, $9\frac{1}{8}$ by $6\frac{1}{8}$ in., for top and bottom. All

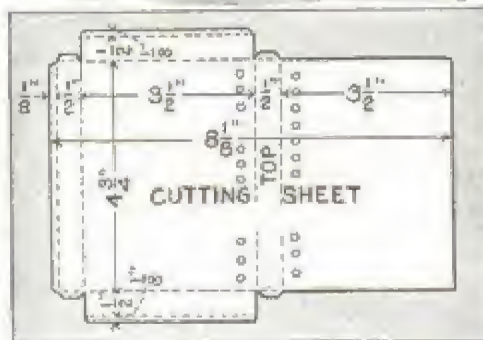
the parts were $\frac{3}{8}$ in. thick. Both ends and the bottom of the front board are rabbeted to a depth of $\frac{1}{2}$ in., $\frac{3}{8}$ in. wide, to take the ends and bottom, and the back at the ends and lower edge to form a joint for the bottom. The top can be rabbeted all around, and fitted in the sides, but, as the joint will show in any case, this is not necessary. The rabbeting was done by sawing the back line to the proper depth with a small coping saw, and the joint then was cut out with a chisel.

With the six sides completed, the parts were assembled with $\frac{5}{8}$ -in. round-head brass screws, and the corners, of brass, also from the ten-cent store, attached with similar screws, $\frac{1}{4}$ in. long. After the assembly is completed, mark a line around the box $1\frac{1}{2}$ in. below the top, and saw it apart on this line. If large-size brass corners are used, with $1\frac{1}{16}$ -in. sides, it will be necessary to cut them down with snips and file to clear the cut mark, shaping the



Left, Painting the Design with Asphaltum Varnish; Right, Etching the Plate; Center, Details of Humidor Construction

sides to conform to the previous curves. The cedar lining may be obtained from old cigar boxes, or $\frac{1}{4}$ -in. cedar boards can be bought from a lumber dealer. The latter make the best lining,



from a sheet of 18-gauge sheet brass by etching away the surplus metal with a solution of one part nitric acid and two parts water. The design is so arranged that the picador's lance and the tail of his horse, sweeping back between the bull's horns, tie it together as one unit.

The materials needed include a sheet of 18-gauge brass, 5 by 6 in.; a small can of asphaltum varnish, sold in most paint stores, a fine-tipped brush, twenty cents' worth of chemically pure nitric acid, and a glass tray or dish, large enough to hold the plate. One of the waterproof fiber trays used by photographers will do, since the paraffin coating will resist the acid.

Clean one surface of the brass and, with a sheet of carbon paper, transfer the design to it. Next paint over that portion which is to be preserved with the asphaltum paint, as shown in the photograph, taking care to get the edges smooth, and such thin parts as the lance, tail and horns about $\frac{1}{16}$ in. wider than they will be in the finished piece. This extra width, which has been added to the design, will offset the sideward eating of the acid. This precaution is important. After the paint has dried, coat the entire back surface and edges of the brass, so that the acid cannot attack the metal from beneath, and set the brass aside for twenty-four hours until the paint is perfectly dry.

Mix the nitric acid with two parts of water, being sure to pour the acid into the water, and not the water into the acid, as the latter method is apt to result in splashing and painful burns, or damage to the clothes. Lay the brass sheet in the tray and cover it with the acid solution. Within a few seconds bubbles will begin to appear. Watch the solution carefully, and if it starts to boil rapidly or give off thick greenish-brown fumes, add more water carefully until the process has been slowed down to slight bubbling. As the acid eats into the brass, the metal dissolved in it will gradually form greenish copper nitrate, turning later to blue as the amount of dissolved copper increases. The same acid can be used several times, however, until it has reached a very deep blue. Eventually it will be "killed" by the dilution with metal salts, but a single mixture is sufficient to etch several such plates as the one needed.

From time to time the work should be removed from the bath and examined carefully to see that the paint is holding and to gauge the progress of the etching. Use a pair of pliers to pick up the brass. The acid will not harm them beyond depositing a coating of copper, which may

be washed off with water. In case any of the acid is splashed on the skin or clothes, wash the affected part immediately in water, preferably with a little ammonia in it.

If the acid is permitted to bubble too fast, the gas released, getting under the edges of the paint, will lift it free and permit the nitric solution to attack the design. If that happens, wash off the work with water, dry it, and then repaint. Proceeding slowly, it may take four or five hours to eat away all the surplus metal, but slowness is better than too much haste, which either will spoil the work, or cause a 24-hour delay while a new coat of paint is drying.

When the etching process is completed, the paint is removed with turpentine and the edges of the work smoothed down with a small file. The surface is then polished with pumice stone and water, two holes drilled to take the screws, and the plate is ready to be mounted. The brass corners, handles and latch are likewise cleaned with pumice, and all the brass work lacquered to preserve the finish.

Leaky Roofs

Although the roof had been resingled lately, a small leak occurred. Being unable to locate the leak myself and after

two roof contractors had assured me that it was "fixed this

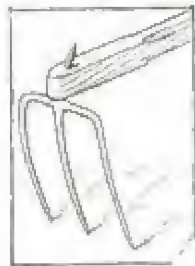


Tar-Paper Trays Set under Drip Remedy Trouble of Leaky Roof

time," the next rain proved the contrary. Climbing into the attic, I located the point where the water ran down a rafter and from there fell to the ceiling. I came to the conclusion that tar-paper drip pans placed directly beneath this rafter would remedy the trouble. I made them of different lengths and widths and about 4 in. deep. By folding them over at the corners and fastening these with a copper rivet, the trays are complete as the photo shows. It is not necessary to empty the trays even after a heavy rain, as only an inch or so of water will collect in a tray, and this soon evaporates, thus also keeping the attic less hot.—Frederick Boesser, Arlington, N. J.

Improved Garden Tool

Every farm has old pitchforks that have been discarded on account of broken handles. The ambitious farm lad can make them into useful garden tools.



The sketch shows how a fork was converted into a garden cultivator. A hole, a trifle smaller than the shank of the tines, was drilled at an angle in the end of a 1½-in. stick. The shank of the tines was forced into the hole in the handle. A drawknife was used to take off the edges of the handle to

make the tool easy to hold. It is very useful for cultivating onions, carrots and other similar garden truck.

Patching a Slate Roof

When a slate roof starts to leak because some of the units have come out where nails have rusted away, the home owner usually makes a repair by using pieces of galvanized or black sheet iron and shoving these up under the slates. This makes a bright spot on the roof, emphasizing the fact that a slate is missing. The iron soon starts to rust and then disfigures the roof still more. Sheet lead on the other hand soon turns as black as the slate, and being thicker than the iron pieces, will be held more securely by the upper slates and will last for many years. Ordinary thin wood shingles, cut to the proper size and colored the same tint as the slate make a much better repair than sheet iron. The inexperienced man who attempts to punch holes in attached roof slate usually succeeds in cracking it and thus makes a bad matter worse. If a very sharp tempered steel tool is used to punch the nail holes by striking the head of the tool a sharp blow with a hammer, the slate will not crack and a clean-cut nail hole will be made. If a drill or soft-metal punch is used the

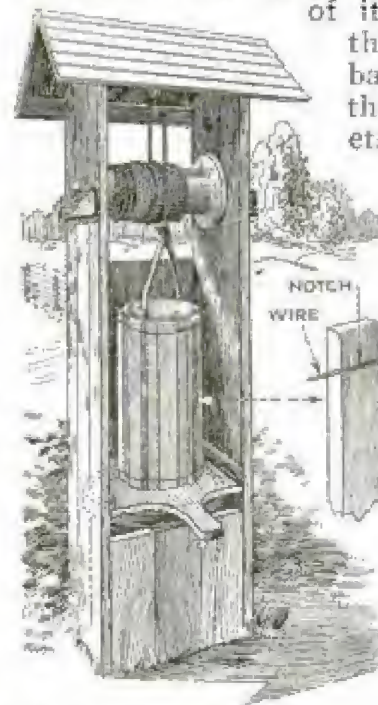
slate will be cracked across or split into thin flakes. If care is taken to raise the edges of attached slates just enough to allow the entrance of a thin colored or stained wood shingle, the patch will not be noticed at a casual glance, and the shingle will be held in place by the upper slates for years, although it is not nailed.

Substitute for Ferrotypes Sheets

Glossy prints may be made on the window panes in an emergency where the regular ferrotypes sheets and accessories are not available. The glass is prepared by first daubing it with a solution of paraffin in benzine, and then briskly polishing it with flannel. The wet prints are stuck to the pane, the excess water is rolled out with a pencil, and the print is then left to dry. Prints made in this manner are remarkably free from the minute cracks that are often present in those that have been ferrotyped on old or defective sheets.—W. Eidman, Cleveland, Ohio.

Protecting Well Buckets

Terra cotta or tile for tubing in drilled wells is becoming quite popular because of its durability, but there is one drawback to its use in that metallic buckets wear out too

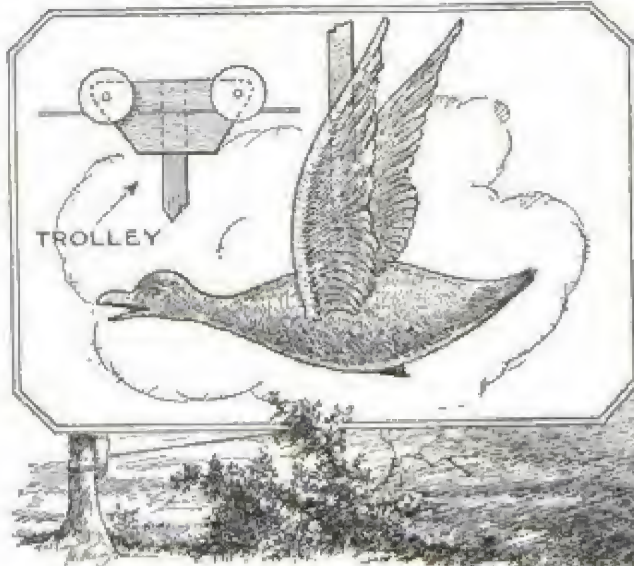


rapidly due to friction against the walls. A farmer eliminated this wear by applying a jacket of small hard wood strips to the bucket as shown in the drawing. Several strips are cut the same length as the buck-

et, and notched across the width about an inch from each end. They are placed all around the bucket and bound tightly to it with two strands of telephone wire. The wire is below the surface of the wood and cannot come in contact with the tubing, and the strips receive the wear instead of the bucket. They can readily be renewed whenever necessary.—L. M. Jordan, Vredenburgh, Ala.

Moving Target for Wing Shooting

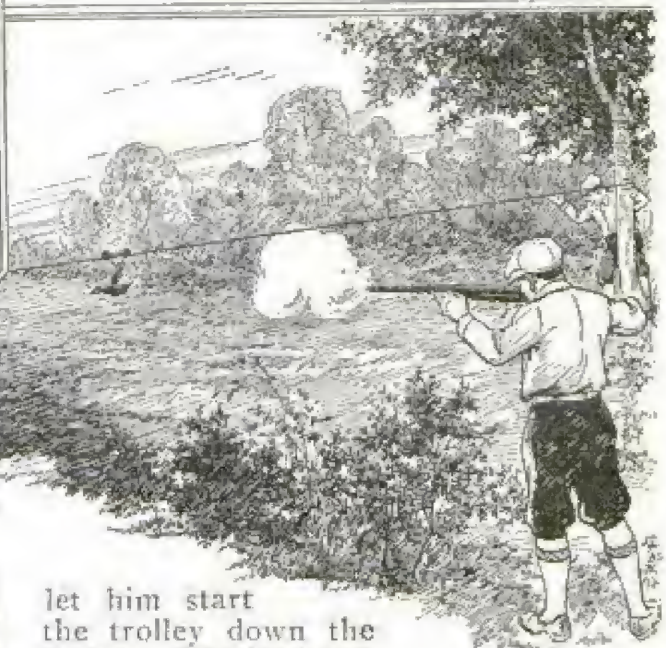
The drawing illustrates a novel moving target with which the aspiring marksman can practice shooting birds on the wing.



Novel Method of Practice for Shooting Birds on the Wing by Arranging Dummy Bird on an Inclined Trolley Line

It requires no springs or complicated mechanism to effect the flight of the bird but makes use of the force of gravity. The arrangement consists simply of a taut wire, a suitable running gear and a dummy bird cut out of wood or, better still, of metal. First choose the spot for your target practice, which should be an open space of ground secluded from passers-by and, if possible, with trees bordering it a hundred feet or more apart. Select two trees and stretch between them a length of stout wire without kinks or splices. One end should be as high as you can reach and the other end about 3 ft. from the ground. The trolley is easily made by cutting a piece of wood to the shape indicated, about 4 in. wide and 8 in. long on the top. Pivot a window weight wheel at each end, near the top, with screws so that the wheels can turn freely. Then, on the back side of the board, screw a strip of strap iron at right angles to the edge so that it will project below the wood about 1 ft. The bird should be large enough to form a fair-sized target. A goose is shown in

the illustration, and was made out of hardwood. However, metal can be used, if desired, although it is harder to form for the amateur. Suspend it from the bottom of the strap iron, as shown, and paint it to imitate the bird. Take your stand in the clearing and have a companion place the rollers on the wire. Then, at a signal,

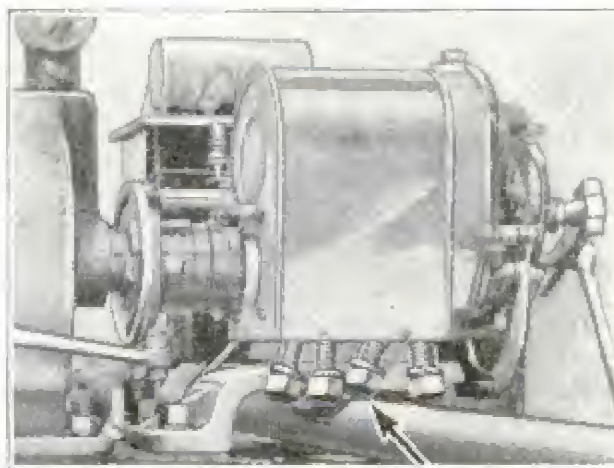


let him start the trolley down the incline. The bird will gain speed on its flight and will offer a fine test for your skill in shooting on the wing. Arrange some bagging at the other tree to take up the shock when the bird hits it.—L. B. Robbins, Harwich, Mass.

Magneto Holds Loose Bolts

While making repairs and adjustments on a tractor, which requires the removal of small bolts, there is danger of having these mislaid and lost if they are merely placed on some surface of the machine, and especially if the work has to be per-

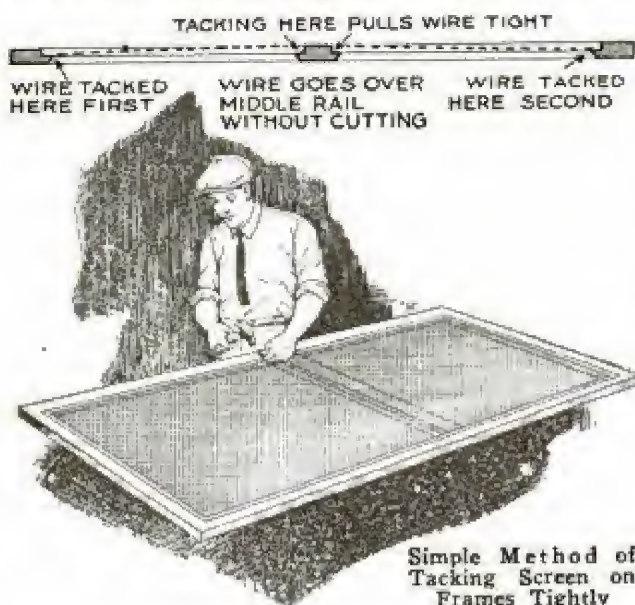
formed out in the field, where a suitable box is not at hand. The photo shows how the parts may be placed on the base of the magneto and held there by the magnets. They cannot easily be brushed off from here and can be distributed so that their proper places may be known when replacing them.—George G. McVicker, North Bend, Nebr.



Using Tractor Magneto to Hold Loose Bolts While Making Repairs

Attaching Screen Tightly to Frames with Center Rails

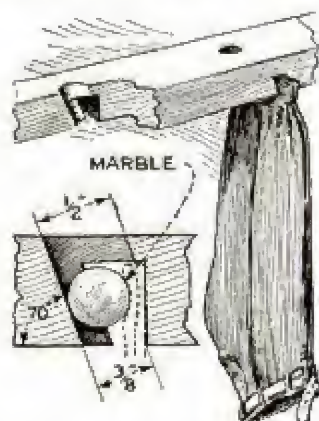
Fastening screen to door and window frames, so that it is without wrinkles and



loose places, can be done easily by the simple method shown in the illustration. Cut a piece of screen about 6 in. longer than the whole opening to be covered. Then tack it at one end, stretch it as well as possible by hand and tack at the other end. It will not be quite taut, but by tacking it down on both sides of the crosspiece, all sag will be taken out. The screen can now be tacked along the sides without difficulty, and the surplus at one end cut off with an old file sharpened to a knife-edge.

Hanger for Clothes Closet Saves Space

In closets where space is limited, the novel clothes hanger shown in the illustration will be found useful. A length of



1 by 3-in. stock is obtained and $\frac{1}{2}$ -in. holes drilled, 8 in. apart, about halfway through the wood at a 70° angle. The hole is continued with a $\frac{3}{8}$ -in. drill, keeping in line with the left-hand slanting side of the $\frac{1}{2}$ -in. hole. Then a slot is sawed in the

board, slanting through the middle of the smaller hole and straight on the opposite side, as shown in the cross-sectional view.

Marbles, which just fit in the $\frac{1}{2}$ -in. hole, are dropped in at the top. They cannot fall out through the $\frac{3}{8}$ -in. hole but stop near the bottom binding against and holding the clothing.

Keeping Handles on Sharp-Edged Tools

Handles often come off chisels, gouges and other tools when using them. The following method will remedy the trouble. Mix 2 parts of wax, 2 parts of brick dust and 8 parts of rosin, heat the mixture and apply it to the inner surfaces of the tool handles, then immediately insert the shank of the tool. If this is done quickly, the shank will stick in the handle securely.

Preserving Botanical Specimens

Preservation of botanical specimens, such as leaves and flowers, by pressing them in books is rather unsatisfactory as they are apt to become damaged when removed for examination or study. A better method is to remove the specimens from the books after they have been pressed and dried, and place them between photographers' dry plates, from



which the emulsion has been removed by washing them in a bath of strong lye solution. By snapping a wide rubber band around the plates, the specimen will be held in position for examination or

tracing. A protecting frame is thus obtained which allows rough handling, and specimens can be piled upon one another without damage.

Preheater for Ford Inlet Manifold

A preheater for the inlet manifold on Ford cars, which will prove satisfactory even on low-grade gas, can be made simply by wrapping some stranded copper wire, of the kind used for radio aerials, around both inlet and exhaust manifolds, to bind them into one unit. The copper conducts the heat from the exhaust to the inlet manifold and helps vaporize the fuel. —G. E. McAllan, Millicent, Can.



The Tool Chest Open, with Trays and
Astonishing Number of Tools Fitted in Small Space

An Apartment Tool Kit for Six Dollars

A HANDY fitted tool chest, providing a safe place not only for the tools needed for radio building and home repairs, but the screws, brads, bolts and nuts, as well as other small parts, can be built by the novice at home, and fitted at small cost, largely from tools found in the ten-cent stores. The chest itself is made from one of the small, light wood-and-steel-covered boxes sold in trunk stores and by many hardware dealers. It is built up of light wood, $\frac{5}{8}$ in. thick, covered on the outside with thin metal, enameled in sage-green, and bound with brass corners, with trunk-style latches and lock to keep the contents secure.

The box used had inside dimensions of 7 by 16 in. and was $5\frac{3}{8}$ in. deep. It came fitted with a full-length tray, with an inside depth of $1\frac{3}{4}$ in. The tray was cut in two sections, each 7 in. long, the center 2 in. of its original 16-in. length being discarded, and the open ends of the two sections were closed with strips of cigar-box wood, $1\frac{3}{4}$ by 6 in. The cleats on which the long tray had rested were removed, cut into $6\frac{1}{2}$ -in. lengths, and two of them renailed along the sides of the box, at one end, low enough to allow the two new trays, when nested one above the other, to rest on the cleats and come level with the top of the chest. That left

a space $2\frac{1}{8}$ in. deep, beneath the trays, for the longer tools in the bottom of the box. A 3-in. strip of $\frac{1}{2}$ -in. wide brass was bent to form an angle bar, and screwed to the back of the chest at the end of the two trays, to keep them from sliding sideways. The two trays were divided into small compartments for radio parts, solder and flux, and spare electric-light plugs and fuses, with a long narrow space in the upper one for extra coping-saw blades, small files and pencils, and another space for small dividers and calipers.

From the parts of several cigar boxes, a chest of three drawers, $6\frac{1}{2}$ by 7 in. by $4\frac{1}{4}$ in. deep, was built to fit in the opposite end of the chest. The inside depth of the drawer chest was $3\frac{5}{8}$ in., which was divided equally between the three drawers. These are fitted without slides, working back and forth on each other. The drawer fronts project at each end $\frac{3}{16}$ in., to fit flush with the outside of the box, and the top edge of the top drawer and bottom edge of the lower drawer have similar projections. Each drawer was divided with partitions, cut from cigar boxes to form nine small compartments, $1\frac{7}{8}$ by 2 in. by 1 in. deep. The 27 compartments of the three drawers take care of a wide range of small nails and brads, screws, machine screws, taps, picture nails,

and other articles. Cleats were nailed to the sides of the tool chest $1\frac{3}{4}$ in. above the bottom, to carry the drawers.

Between the drawers and trays, in the opposite end, there is a space 3 in. wide

neath the drawers and trays was filled with an assortment of larger tools, including wood chisels from $\frac{1}{8}$ to 1 in. in width, a small steel-framed coping saw and a larger saw, taking either wood or hacksaw

blades, a tack hammer, two screwdrivers larger than those on the lid, several files, small tin snips, a small try-square and a machinists' square, several sizes of round, flat and triangular files, packages of extra coping and hacksaw blades, an assortment of extra drills, including all the odd numbers from 1 to 59, inclusive, and a small

radio drill. A small block plane and a vise made to clamp on the edge of a table drop into place between the trays and drawers, along with such odds and ends as spools of wire.

The cutting tools—chisels and block plane and wood carvers' knife—the special saw which handles both wood and metal work, and the radio drill came from a hardware store. Everything else was picked up at the ten-cent store hardware counters, which kept the total cost to a very low figure. The chest itself was bought at a sale for \$1.75, and when completely fitted the entire cost was slightly over \$6.

the full depth of the box. As pliers are among the most used tools, two pairs, one with long noses and the other of the side-cutting type, were fitted to the back and front. The long-nosed pair, purchased first, rests in a V-shaped wooden sheath, cut from cigar-box wood, while the other, attached more hastily, has a leather sheath made from part of a discarded glove.

The lid fittings included others of the more often used tools. Two strips of bakelite, $4\frac{1}{2}$ in. long, $\frac{3}{4}$ in. wide and $\frac{1}{4}$ in. thick, attached $\frac{1}{2}$ in. apart, provide space for ten sizes of drills and a countersink. Two screwdrivers, a reamer with detachable handle, two sizes of flexible wrenches for radio nuts, a small steel hammer, a wood carvers' knife, and a folding footrule complete the lid fittings. They are held in place by leather strips and clips made from spare radio gridleak and resistor clips. The space be-

Drawer Compartment and One Tray Removed from Chest, Showing How They Are Partitioned



Cleaning Suede Leather

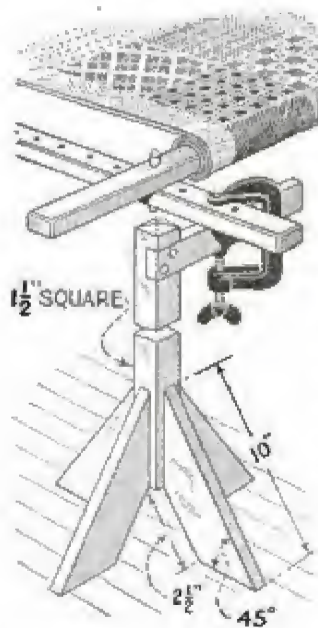
Ladies purses, shoes, bookbindings, and other articles made of or trimmed with suede or "ooze" leather, get easily and quickly soiled and shabby-looking. The grime and dirt cause the rough surface to become black and shiny at points. Ordinary methods of cleaning are ineffective, but rubbing with a piece of fine sandpaper will restore the original appearance of the leather. This will raise the nap. The same method can be used for removing shine from clothing. —J. S. Hagans, Chicago, Ill.



Chest Completely Fitted, with Block Plane and Calipers Lying on Drawer Top

Handy Quilt-Frame Props

The present fad for old-fashioned patchwork quilts is bringing the old quilting frames out of their dusty hiding places. There seem to be a few sets in every town that go the rounds of church-society quilting bees and do private service between times. In our society we have found that we must always count out four chairs with straight backs to hold up the frames, and this at such a height that those sewing on the quilt have to stand all the time. One of our number, whose husband is a carpenter, devised a set of props which made a hit with the whole society. They are very substantial, hold the quilt at such a height that those who work can be seated around the quilt with knees under it, and they not only allow four more chairs to be used for seating purposes, but the props are much more convenient



to get around the corners. Four strips of pine, $1\frac{1}{2}$ or 2 in. square and $25\frac{1}{2}$ in. long, are cut exactly alike, and the edges are dressed to avoid splinters. Four base supports for each standard are cut from a 4-in. board, according to the dimensions given in the drawing. These supports add 2 in. to the height, making the total height $27\frac{1}{2}$ in. Four arms are cut 6 in. long from a 1-in. strip of pine and one arm is attached to each upright in a horizontal position. The frames are easily held in place upon these arms by means of small C-clamps.—Mrs. Ruth Darling Shultis, Albion, Mich.

Chain Silences Rattling Keys

To avoid the rattling caused by a bunch of keys striking against the metal edge of the dashboard of an automobile, attach the ignition key to the ring with a $2\frac{1}{2}$ -in. length of light chain, incased in rubber tubing. This will effectively remedy the trouble. The chain should be long enough to permit the keys to hang $\frac{1}{2}$ to $\frac{3}{4}$ in. below the lower edge. This will also prevent the keys from wearing the paint off a portion of the dash.

Improving Vacant Lots

A home owner at Crete, Nebr., who had a vacant lot adjoining his place in the edge of town, recently turned this into a beautiful nook simply by digging a winding shallow pool, lining it with concrete



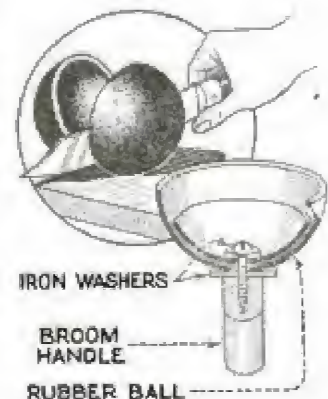
Vacant Lot Improved by Artificial Pool with Rustic Bridge over It

and gravel and building a pretty rustic bridge on it as shown in the photo. The concrete was laid an inch thick and was placed over the entire surface and the shore was lined with crushed rock. In some cases concrete might be dispensed with by lining the pool with pure clay, and surfacing this with gravel or sand. Clay is almost waterproof and can be spread over a large area. If running water is available, a small stream can be permitted to run into the pool continuously. The photo was taken in early spring before vegetation had begun. The body of water is about 8 or 10 in. deep. If the pool is lined with concrete, a drain should be provided so that the water can be changed frequently during hot weather.—Dale R. Van Horn, Walton, Nebr.

Improvised Force Cup

Most people know the usefulness of a plumbers' force cup for cleaning out a clogged sink drain.

When a regular force cup is not available, a good substitute can be made by cutting a hollow rubber ball in two, one part being cut slightly smaller than the other. Place the smaller part into the larger one and fasten both to the end of



an old broom handle with a screw, the rubber being protected with iron washers, as shown in the accompanying drawing.—James Noble, Toronto, Can.

Exhaust Gases Cook Meals for Auto Tourists

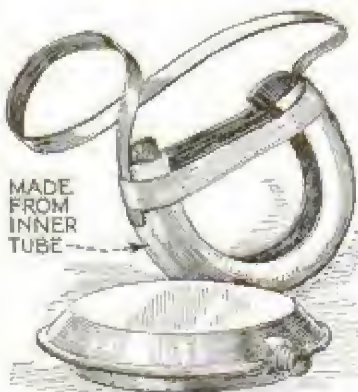
A fireless cooker of a novel kind was cleverly arranged by a western tourist who recently took his family for an auto trip



to the Pacific coast. The cooker—of the so-called pressure type—was attached to the running board, and connected by a tube to the engine exhaust. Thus, all he had to do was put the food in the cooker and the hot exhaust gases did the rest.

Homemade Canteen

The illustration shows the construction of a canteen and a carrier that anyone who can handle a soldering iron can make at home. It is cheap, yet will serve the purpose as well as an expensive one, and the owner will have the satisfaction of knowing that he built it himself. Buy a couple of tin pie plates that have slightly rolled edges and are of the same size. Cut a small notch in the edge of each. Then place them together, notches meeting, and bind them in place with cord. Place in a vise and sweat solder completely around the circumference, making a water-tight joint. Cut out the screwcap from a polish



can and enlarge the notches in the tins to correspond with its size and shape and solder this cap in the hole. This completes the canteen. The holder can be made from a section of inner tube. This should be shorter than the circumference of the canteen and should be split on the inside

as shown. From a second tube cut a long piece for a carrying strap, then make a third loop of rubber to hold the ends of the slit tube fairly close together. Fasten the strap and loop to the tube with tire cement or by vulcanizing. The canteen is simply pushed down into the holder and the strap thrown over the shoulder in the usual way.—L. B. Robbins, Harwich, Massachusetts.

Unpainted Tool Handles Preferable

One frequently finds that handles of tools and implements used around the house have been painted to improve their appearance. This practice is, however, a poor one, as a coat of paint or varnish blisters the hand when using the tool, because of the greater friction between skin and paint. The tool handles should, therefore, be allowed to retain their natural finish.—A. C. Cole, Chicago, Ill.

Novel Doorstop

When visiting some friends I saw a novel doorstop. Instead of the usual carpet-covered brick or a leather bag full of sand, the weight was an ordinary rubber filled with lead. This can be made in the following way: Procure several pounds of sheet lead such as is used for wrapping tea; melt it to a running heat, then skim off the dross and pour the lead into the rubber. The hot lead will not injure the rubber, but as a precaution the overshoe may be placed in a pan containing cold water while pouring. After the lead has cooled, the exposed portion at the top is painted to match the rubber. When this stop is seen against a door the impression is that it is there by mistake, and one is inclined to push it aside or pick it up. If he yields to this impulse, the visitor will have a surprise and the host a laugh.—J. E. Noble, Toronto, Can.



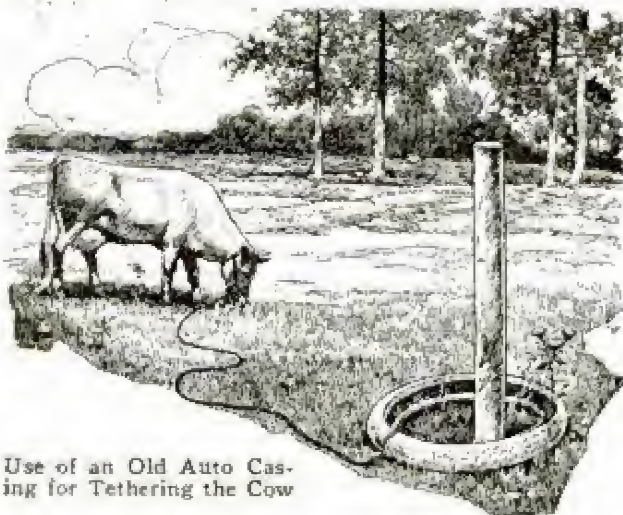
¶ If you want to enamel your car and avoid streaks at the laps, add a little kerosene to the varnish; this will delay drying long enough to enable you to make a good joint with the first portion painted.

Repairing Grounded Timer Screw

Ford timers sometimes give trouble by grounding one of the contact screws on the shell. This causes a continual spark in that cylinder and the motor will kick and backfire. The coil is also likely to overheat. If a new timer cannot be obtained, remove the wire and nut from the grounded screw and pull off the washer. This may be cracked. If so, several thicknesses of paper, with a small hole through the center, can sometimes be used as a washer. Metal cuttings often cause trouble by lodging between the fiber ring and the shell of the timer about the contact screw. This is because of a shrunken fiber ring, and can, in some cases, be cleaned out by squirting gasoline about the screw. If this fails to remove the cuttings, the fiber ring and the contact screw must be removed from the timer, and the cuttings wiped out. Take care to replace the ring and screw with the same side in. A little shellac run between the fiber ring and the timer shell will keep out the cuttings for some time, and is worth trying if the timer is otherwise in good condition.—E. T. Gunderson, Humboldt, Iowa.

Tethering Cows

Tying and untying the tether rope is rather troublesome and can be eliminated by using the method shown in the illustration. The rope is tied to an old automobile casing, which is simply thrown over one of several posts driven into the ground in the grazing field. Another advantage of using this method is that the casing will roll around the post preventing the rope from winding around the pole

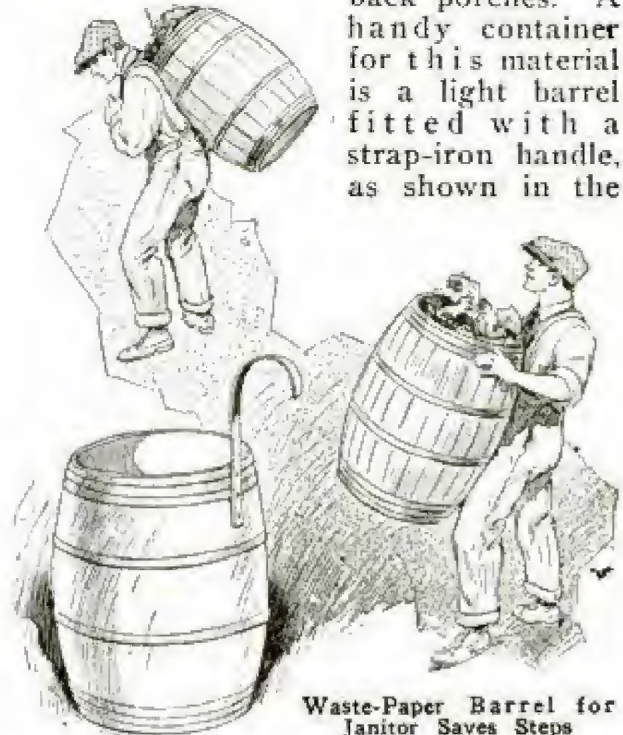


Use of an Old Auto Casing for Tethering the Cow

and thus bringing the cow close to it and decreasing her grazing area.—L. M. Jordan, Vredenburgh, Ala.

Janitor's Waste-Paper Barrel

One of the daily duties of the janitor of an apartment building is the collection of waste paper and other refuse from the back porches. A handy container for this material is a light barrel fitted with a strap-iron handle, as shown in the



Waste-Paper Barrel for Janitor Saves Steps

drawing. The handle is fastened on with bolts in the manner shown. The hook is made large enough to go over the worker's shoulder. The barrel can be carried on the back or on the chest as convenience and necessity may require.

Preventing Small Tractors from Overturning

Small, light tractors are frequently used for pulling stalled trucks out of ditches, or similar heavy work. For this they are quite efficient, but on a heavy, dead pull, they are apt to turn backward, and injure or kill the driver, the tendency to turn over being due to the action of the worm gear in the differential. To prevent such an accident, the tractor should be driven so as to face the truck to be pulled out, and should be hooked up in a reverse manner; that is, the chain should be fastened to the front of the tractor. The tractor should then be thrown in reverse and the truck pulled out by backing the tractor away from it.

According to a railroad paint chemist, one of the best formulas for making a paint for structural iron, such as bridges, is as follows: French yellow ochre in oil, 39 lb.; lampblack in oil, 1 lb.; raw linseed oil, 54 lb., and japan drier, 6 lb.

Removing Meat from Muskrat Skins

Trappers in the coast country near New Iberia, La., have found that a common clothes wringer is very handy for remov-

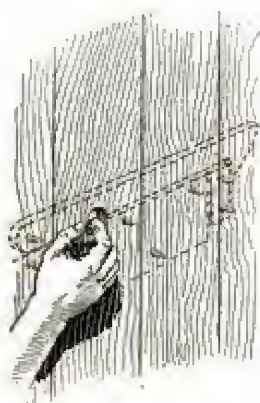


Hunters Use Clothes Wringer to Remove Meat from Muskrat Pelts

ing superfluous fat and meat from muskrat hides, and hence this familiar laundry appliance is part of the standard equipment of every trapper in that region. When the marsh inhabitants have skinned the trapped muskrats they turn to the clothes wringer for the next operation in the preparation of the pelt for the market. Inserting the muskrat skin, which is wrong side out and covered with fat and meat, into the clothes wringer, the pelt is run between the rubber rollers to come out clean with all the meat off. Grease "burns" a pelt, and must be removed to get top prices for the furs.

Secret Sliding-Door Latch

A farmer who was troubled by peddlers opening the sliding doors of his barns and outbuildings, devised the latch shown



in the drawing, with which he effectively foiled all inquisitive persons. A slot, about 3 in. long and 1 in. wide, was cut through the door about 3 ft. from the floor and 2 ft. from the jamb. Thus it resembled the fingerhole common on barn doors with which they are opened. A latch, about 2 ft. 6 in. long, was cut from

a strip of oak, and the narrow end pivoted to the door on the inside by means of a

large screw. A block was fastened to the jamb for the latch to rest on, and a metal guide was provided to keep the latch close to the door. Finally a wide cleat was screwed to the door, covering all but about 1 in. at the top of the fingerhole, but leaving enough space under the latch to permit the insertion of a finger to lift it.

Renewing Window Shades

When window shades become faded or worn out at the bottom, they can be made to wear again by cutting them off the roll, tacking the bottom to the roll and hemming the other end, which then becomes the bottom. This is an efficient method of using curtains that would otherwise be discarded.—Charles Latour, Jr., Plattsburg, N. Y.

Drawer Pulls for Rustic Furniture

One of the difficulties that meets the maker of rustic furniture is to provide drawer pulls that will harmonize with the style. The various pulls that can be purchased in a hardware store will not fill the bill. I have tried knots of rope and whittled wooden handles, but nothing suited me entirely until I hit upon the idea of using pine cones, preferably the small hard ones of the lodge-pole or jack pine. If kept dry, they will never open. They are attached to the drawer by means of a $\frac{3}{16}$ -in. screen-door hook from which the hook end has been cut off. The remaining shank is threaded and attached to the drawer front by means of a small nut on the inside, while the screweye is driven into the pine cone. This forms a pendant pull of pleasing and harmonious effect.—Alfred Neuman, Troy, Mont.



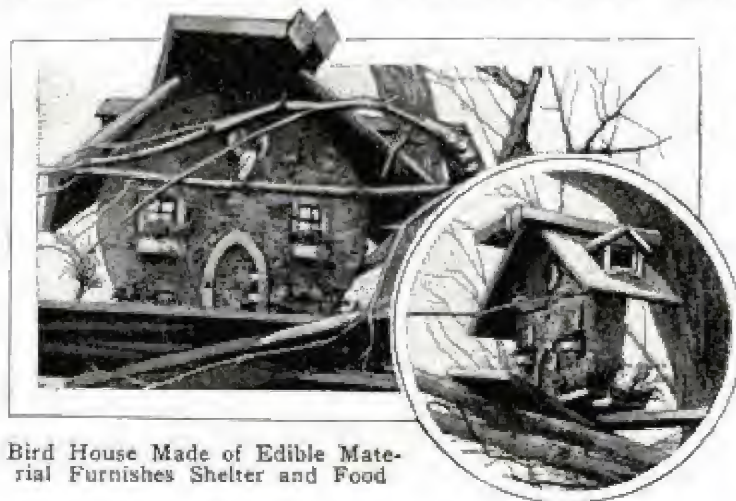
Curved Printing Surface for Sharp Focus in Bromide Enlargements

Practically all of my negatives are of post-card size, and, in making bromide enlargements, I experienced difficulty in getting a satisfactory focus on 6 by 10-in. or 8 by 12-in. prints. When the center of the picture was in focus the outer portions were usually blurred, and vice versa.

Compromising between the two gave unsatisfactory results. By providing a curved surface, on which the bromide paper is mounted, results were obtained that are satisfactory except for architectural subjects. A wooden box was made as long as the desired print and 1 in. wider. The height may be made as is convenient, but a height of about 2 in. is satisfactory. A partition was fitted into the box, dividing its length into two compartments. The upper edges of the center partition and the ends of the box were cut in the shape of an arc, the curve being determined by the distance from the lens to the easel when the center of the picture is in focus. The bromide paper is fitted to the curves on the box. The device is fitted to the easel by means of two strips fixed to the bottom of the box, and extending beyond its ends. The curved surface may be covered with cardboard to give a better backing for the bromide paper, which is held in place by pins or small tacks. If only a small part of the negative is to be enlarged, the flat surface is satisfactory.—Victor Woodland, Denver.

Edible Bird Houses

Unusual in construction and design, bird houses of edible material have been built by a Cincinnati woman in order to furnish birds and squirrels with food during the winter months, and the animals literally eat themselves out of house and home. The house proper consists of a 30-lb. cake of round crackling, which is pierced with doors and windows of decorative design. Rooms are dug out affording plenty of space. The roof and baseboard are heavily inlaid and coated with seed and broken grain, which is imbedded in lard. Squares of pumpernickel and grains of corn add a decorative touch.

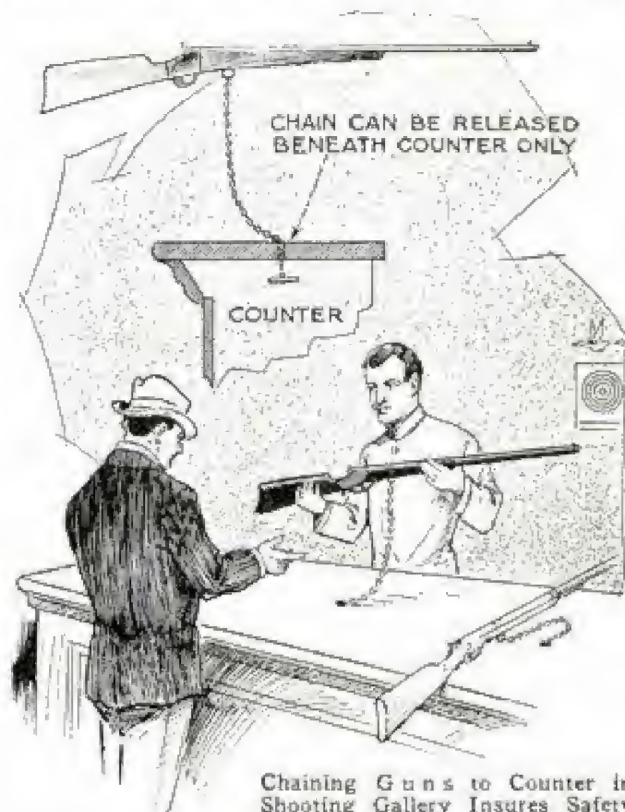


Bird House Made of Edible Material Furnishes Shelter and Food

The dormers are filled with nuts.—L. R. Tichenor, Cincinnati, Ohio.

Safety Insurance for Shooting Gallery

Following the accidental discharge of a rifle in the hands of a reckless patron, which resulted in the shattering of a large



Chaining Guns to Counter in Shooting Gallery Insures Safety

window and some damage to a building across the street, the proprietor of a shooting gallery insured against a repetition by chaining the guns to the counter. The chains used for this purpose were long enough to permit the guns to be used freely for target shooting but could not be turned toward other patrons without some difficulty. The chains are slipped through a hole in the counter and a short crosspiece is fastened to the end of the chain as shown. The chain can be released beneath the counter only, when it is necessary to remove the gun for cleaning or repairs.—G. E. Hendrickson, Argyle, Wis.

Cleaning Greasy Dishes

Greasy dishes can be easily cleaned in the following way: A few pieces of gauze are sewed together to form a little sack, about 4 in. in length, which is filled with borax. The sack is closed on all sides and hot water is allowed to run on the bag for about a minute, while it is lying on a plate. By rubbing the plate with this bag, all traces of fat will disappear without soiling one's hands.—Frank Kaye, Brooklyn, N. Y.

Wagon-Bed Derrick

To avoid the strain of lifting a heavy wagon bed or hayrack by hand when he wishes to make a change from one to the



Windlass on Side of Barn Is Used to Hoist Wagon Box

other, an Indiana farmer has arranged a windlass on the side of his barn as shown in the photo. With this, it is easy to hoist the bed up under the barn roof where it hangs entirely out of the way and protected from the weather until needed again.—J. M. Collins, Kansas City, Mo.

Writing on a Moving Train

Writing legibly on a fast-moving train is difficult to a person unaccustomed to it. The railroad conductor knows the trick of it and manages to get along quite satisfactorily. He prefers to write in a standing position and holds his right elbow firmly against his side. The reason for this is that in a sitting posture there is too much lateral movement in the trunk of the body, while in a standing position this is more easily controlled. When the arm swings freely, as in ordinary writing, several joints of the body are affected in the process, each of which is capable of its own motion. Holding the elbow against one's ribs "breaks" these motion tendencies, except that of the wrist, which movement is necessary in writing, and thus the pen is more easily controlled.

The same principles modified apply in using a typewriter on a moving train. Many traveling men, news correspondents, and others, carry portable typewriters and do much of their writing while traveling on trains, not to mention the various railroad and government men who travel in office cars and necessarily must

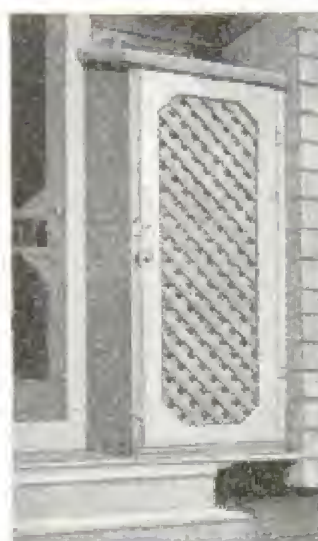
get out their correspondence en route. It is extremely difficult to execute neat typewriting on a moving train with free-arm movement, even in the central portion of the coach. As I am employed in such capacity, I had to evolve a plan to expedite the work. I am able to do typewriting quite rapidly by resting the palm of the hands, near the wrists, against the front edge of the typewriter frame surrounding the keyboard, and using the swing of the fingers instead of that of the whole arm. —Victor Labadie, Dallas, Tex.

Retaining Wood Screws in Hardware

It is often desired to keep the wood screws used for attaching small hardware and automobile dash instruments with them. A good way to do this is to place the screws through the holes in the hardware and wrap a fine wire about the threads. The ends of the wire are twisted together, which prevents the screws from falling out.

Neat Ice-Box Inclosure

Many small homes have no provision made for housing the ice box, with the result that the kitchen is cramped for room or the box has to be put into the dining room or on the back porch, which is inconvenient and unsatisfactory.



With this problem in mind, the owner of a small four-room bungalow built the special inclosure shown in the photo. A corner formed by a jog in the wall of the house formed two walls of the space. The outside was boarded in and an opening left in front into which was fitted a latticed door. The roof was given a good pitch and covered with heavy tar paper. About 2 ft. of space was left over the ice box so that the lid could be lifted, and a hole cut in the floor to permit the waste water to run out, a length of rubber hose being run through the hole and attached

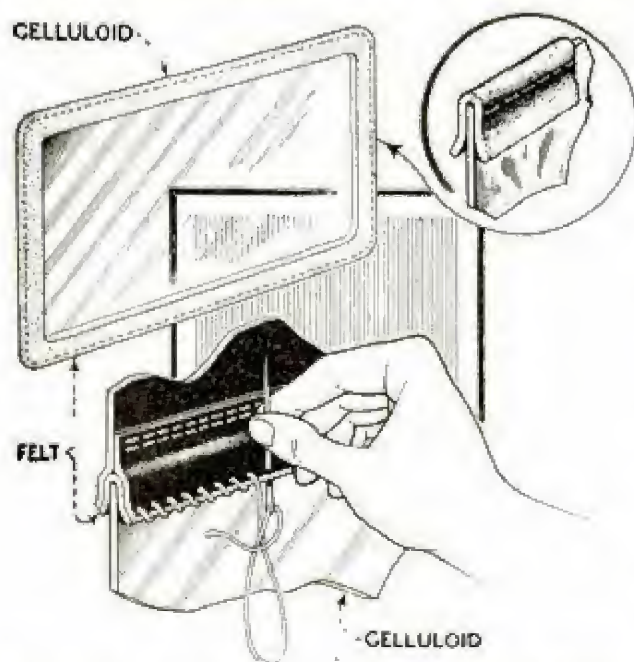
to the drain of the ice box. The lattice door was fitted with a spring latch and a padlock, and had a window shade inside, which could be drawn down in rainy weather to protect the finish on the box.

Keeping Rabbits from Fruit Trees

Coat the trunks of young apple and other fruit trees with the black, tarry paint that is supplied by manufacturers of roofing paper. It is applied with a brush. One liberal coating will last for years and will protect trees from the ravages of rabbits. At a Brushy Mountain orchard of 300 trees near Blacksburg, Va., such treatment was given 211 trees four years ago. Some of the other trees were wrapped, or coated with ordinary house paint. None of the properly painted trees have been molested, while the others have been gnawed more or less yearly. Girdled trees died and the growth of injured trees was stunted.—Dr. H. D. Ribble, Blacksburg, Va.

Replacing Auto-Curtain Lights

Sewing celluloid lights in auto curtains is a rather difficult task, as anyone who has tried it will admit. A good method, which is comparatively easy, is shown in the drawing. A strip of felt is first doubled and sewed to the edge of the celluloid



Quick and Easy Method of Sewing Celluloid Lights into the Auto Curtains

on a sewing machine and the felt can then be hand-stitched to the edge of the curtain as indicated in the lower detail.—G. A. Luers, Washington, D. C.

A Simple Push Toy

Novel toys are always of interest to children, and here is one that will appeal to them, especially as it is an easily made affair. Get two



Interesting Homemade Whirling Toy, Which Will Appeal to the Youngsters

old thread spools, a tin-can cover and a $3\frac{1}{2}$ -ft. length of No. 12 gauge galvanized-iron wire. The method of making the toy is clearly shown in the illustration, and in use it is pushed along on the sidewalk, which will cause the tin-can cover to rotate at high speed, the cover being nailed to the top of the upright spool.

Making Tight Pipe Joints

Lead filings sprinkled on the threads of pipe give a tighter joint than when ordinary white or red lead paste is used. The filings are made with a coarse rasp and are held in place by the cutting oil that remains on the threads. This method was given a thorough test along with methods commonly used, and it was found that, on $\frac{1}{2}$ -in. pipe, about half of the joints filled with lead paste leaked below a pressure of 8,500 lb. per square inch, one failing at 1,050-lb. pressure. A joint on which lead paste and lead filings were used leaked at 3,900-lb. pressure, while those on which only lead filings were used withstood the full pressure of 8,500 pounds.

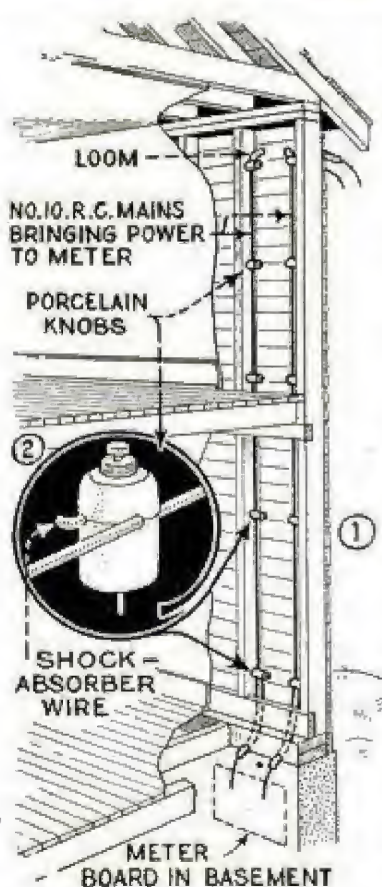
Wiring Your Home



By E. R. Haan

WIRING a house is usually considered the task of an expert electrician, but anyone who is able to grasp just a little theory and follow simple instructions as to the method of doing the work can easily wire his own home. The work of wiring a house is not advised, however, for home owners in the larger cities, where it is necessary that the work be done by a licensed electrician, but is especially recommended for the small-town home owner, and for the farmer. These may make a worthwhile saving by employing their spare time for this purpose. In this article the method of wiring houses under construction will be described, while sequent articles will contain information on wiring old houses, flexible metal-conduit work, fixture hanging, etc.

The first thing to do is to select the necessary tools. Those mostly employed by an electrician are a pair of wire cutters, a hammer and an auger. A pair of 6-in. side-cutting pliers will be found most convenient. A straight-claw hammer is highly preferable to an ordinary carpenter's hammer, as it is frequently necessary to remove porcelain knobs, boards, etc., for which the straight

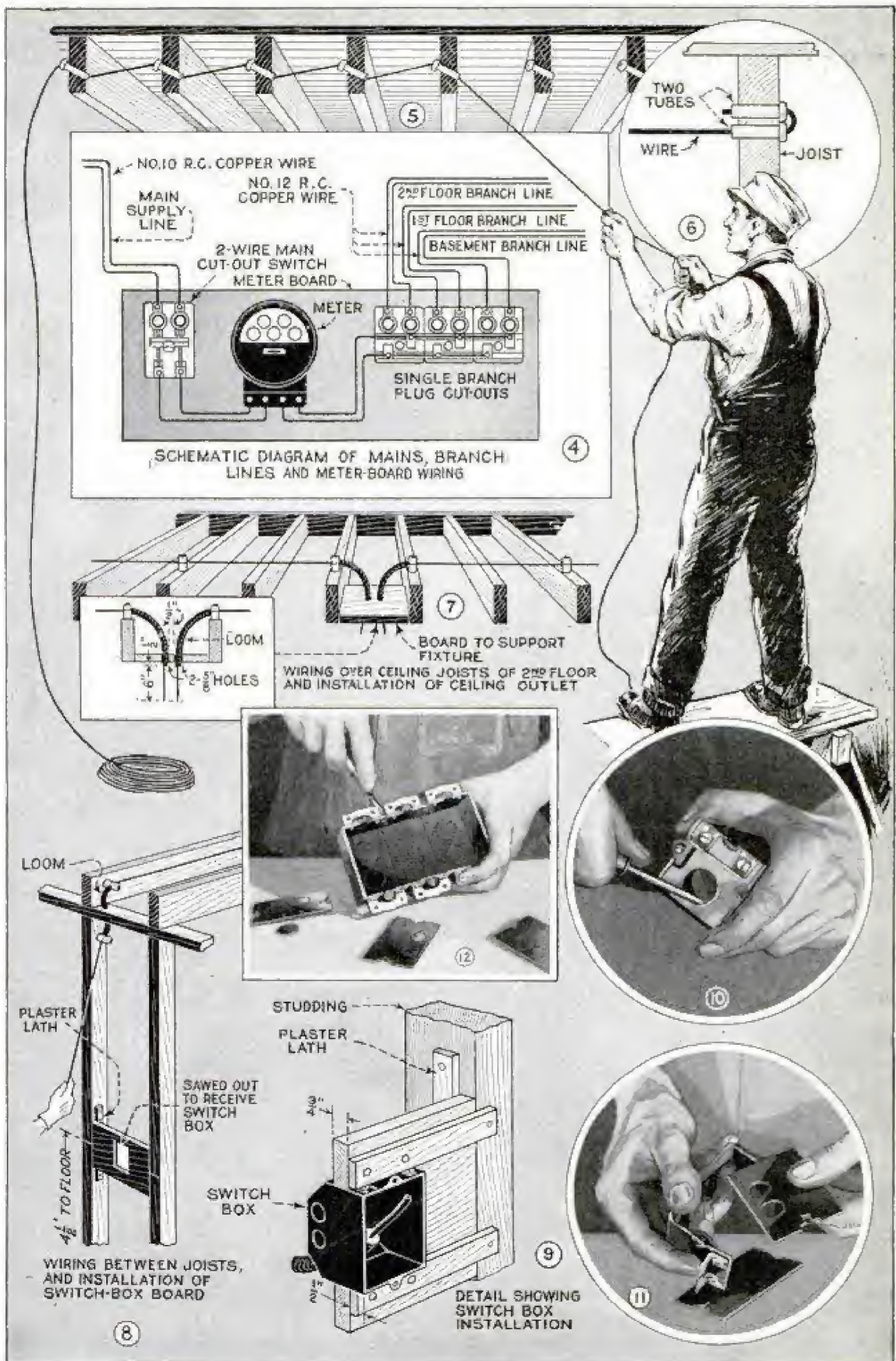


Installation of Main Supply Lines Running to Meter Board

claw is particularly adapted. The handle should be cut short to make it handy for nailing between studdings, joists and rafters, which are usually spaced 16 in. center to center. A $\frac{5}{8}$ -in. auger is the most useful size on a wiring job. Get two or three of these, as they soon get dull and no time should be wasted on the job with a dull drill or in sharpening it. A ratchet brace or a corner brace is absolutely necessary. An ordinary brace cannot be used owing to the cramped quarters in which one must occasionally work. Next, get a couple of screwdrivers, one having a 2 or 3-in. shank and the other a 5-in. shank. A soldering iron and a blowtorch are also requisites for a wiring job, as every connection must be soldered as a precaution against fire and other troubles. The need for a small can of non-acid soldering flux, a pound or two of solid-wire solder, a roll of rubber tape and a roll of friction tape is obvious.

A small keyhole saw is necessary for sawing out holes for flush-switch boxes, and a wood chisel will greatly facilitate this work. For sawing boards a small crosscut or panel saw is used.

Now the materials for the work have to be purchased. Perhaps you can make arrangements with the town



Various Details of a Good Wiring Job Which Can Be Done by an Amateur, No Special Skill Being Required to Do This Work

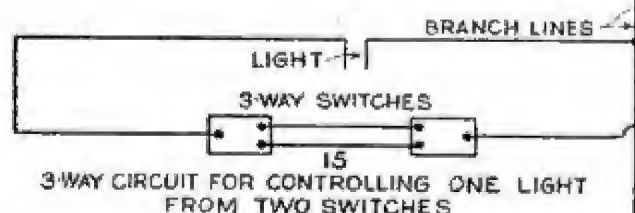
electric shop to return whatever wire, loom, knobs and tubes you may have left, as it is difficult to estimate the exact amount required. For an ordinary seven or eight-room house you should have a 500-ft. roll of No. 14 rubber-covered copper wire; about 200 ft. of No. 12 rubber-covered wire; 100 ft. of No. 10 rubber-covered wire; 50 ft. of "circular loom"; 200 porcelain knobs;

13 DIRECT OUTLET

20 2½-in. porcelain tubes; as many flush-switch boxes as necessary; three double-pole, single-branch, plug cut-outs, and one two-wire main-panel cut-out with switch.

The proper time to wire a new house is just before lathing. Then the partitions will all be up, or should be, the preliminary plumbing work will be finished, the subfloors will be laid, and all the door and window jambs will be in place. The wiring has to be done at this time, and done as quickly as possible, or the lathers will be waiting. Under ordinary circumstances and if nothing untoward happens to interrupt the work, it will take the amateur electrician about two or three days to wire a one-family house of average size.

The "mains" are to be put in first.



Their position is determined by the location of the nearest power-line pole in the street or alley. The mains should be brought out of the side of the house, preferably a few feet below the roof and at a point which is nearest to the city power lines. Drill two holes, about 12 in. apart, near studs as shown in Fig. 1. Now tie a weight to the end of the No. 10 rubber-covered wire, taking the end on the inside of the coil. Always follow this practice in unwinding a coil, as it will prevent getting the wire tangled. Drop the wire down the inside of the wall until the weight hits the first-floor sill. Then drill a hole through the sill and pull the wire into the basement where the meter board is to be installed. Do the

same thing with the other main wire. In some cases it is desired to have the meter on the porch. A similar procedure is then followed, taking care never to cross a joist, sill or studding, but to go through it, pushing a porcelain tube or a length of loom through the hole before threading the wire through. A porcelain knob is nailed to the studding near the hole through the siding, and a length of loom, long enough to reach from the knob to about 4 in. outside of the wall, is slipped over the wire before it is pushed through the hole. Knobs should be located every 4 or 6 ft. apart, and the wire should be drawn taut before the



knobs are driven tight. A short length of wire in the empty groove on the knob, as shown in Fig. 2, will permit one to drive the nail down tight without danger of breaking the knob. Grasp the wire with one hand and pull it taut while driving the knob down as shown in Fig. 3. A good method of straightening wire before knobbing is shown in the headpiece.

After the two mains have been strung, two pairs of branch lines are installed. No. 12 wire is used for this purpose. These lines extend from the meter board up through the partitions and along the center of the ceilings of the first and second floors, from one side of the house to the opposite side, as shown diagrammatically in Fig. 4.



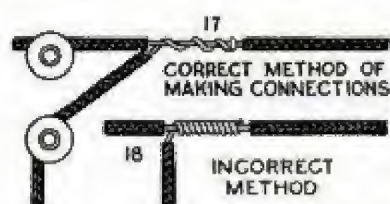
No switches are cut directly in the branch lines, but the wiring to the various rooms is tapped off at points most convenient. It will be found best practice to run the second-floor branch line first. Usually the wires can be strung right over the joists of the ceiling of the second floor, on knobs, instead of passing through them, which saves considerable time and expense.

Wherever outlets are to be located, a piece of ¾-in. board should be nailed between the joists, as shown in Fig. 7,

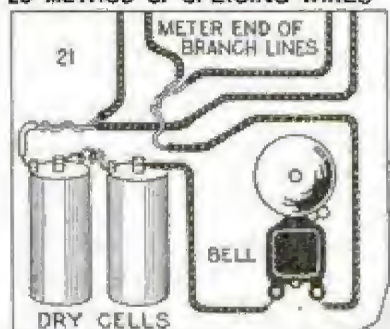
to support the fixture. The ceiling outlets are usually located in the center of the rooms. Wall lights should be about 6 ft. above the floor, switches about $4\frac{1}{2}$ ft. from the floor, and the wall outlets, such as flush receptacles for cords, are located just above the baseboard. To be sure that all switch boxes are exactly the same height, take a stick, $4\frac{1}{2}$ ft. long, set it up vertically and mark the joists, as shown in Fig. 8. This should be done before the board is nailed between them. Flush-switch boxes of the kind shown in Fig. 9 are used. Where several switches are necessary, the sides of a number of single boxes are removed and a larger box formed as shown in Figs. 11 and 12. The open end of the box is put against the board where the box is to be located and the outline is traced on the board, midway between the studs, taking care to have the center of the box on the $4\frac{1}{2}$ -ft. mark that was previously made on the

shown in Fig. 10. Lathing nails and lath are used to fasten the box to the supporting board, as shown in Fig. 9. This practice will prevent lathers from dislodging the box, which is otherwise easily done.

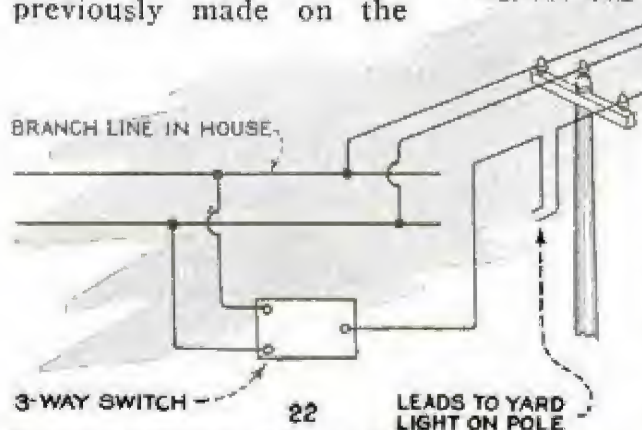
The coil of No. 14 wire is then untied and the circuits of the various rooms wired. Figs. 13, 14, 15 and 16 show the most common wiring diagrams. For hallways and large rooms, it is often desired to have two switches to control one light. The wiring is then done as shown in Fig. 15 and is called a "three-way" installation. Where it is desired to operate two or three lights on a chandelier separately from a wall switch, the installation shown in Fig. 16, using a spe-



20 METHOD OF SPLICING WIRES



NO. 12 WEATHERPROOF COPPER WIRE



Correct and Incorrect Method of Making Connections; Method of Testing the Circuits, and the Wiring of a Farm-Yard Light

studdings. Drill holes at the corners and use the keyhole saw to cut out the hole. The clamps on the boxes are adjusted so that the boxes will project $\frac{1}{2}$ in. beyond the face of the board, as shown in Fig. 9, which makes the edge of the box flush with the surface of the plaster. Before the box is fastened, the necessary holes are made for the wires by pushing out the perforated portions. Use the claw of the hammer to knock the perforated section inward and then bend it with a screwdriver until the piece breaks off as

cial electrolier switch, can be followed. The first time the button is pressed one group of lights is switched on, the second time the second group of lights is on, the third time all the lights are on, and the fourth time the circuit is broken and all the lights are out. These switches can be obtained to operate the lights in different combinations. Wires should never be allowed to touch wood, plaster or metal. At points where the wires must be loose or pass through sills, studdings, ceiling-outlet supports, or switch boxes, a length of loom should be used, fitting snugly between two knobs, as shown in Fig. 8, or from one knob to $\frac{1}{2}$ in. outside of an outlet support or switch box, as shown in the detail of Figs. 7 and 9. Draw the ends of the wires to extend about 6 in. outside of an outlet and then twist the ends together to prevent them from being pushed back into the partition. Wires between knobs should always be pulled tight.

After the wiring of the second floor has been finished, proceed to string the branch wires for the first floor. In this

case all the overhead wiring has to pass between joists or through them. Get a masons' chalkline and mark the underside of the joists to facilitate drilling holes through them in a straight line for the branch wires, which should run parallel to each other and about 6 in. apart. Get a 2 by 10-in. board and improvise a scaffold directly under the position where the branch lines are to be strung. The height of the scaffold is adjusted to suit the worker. The holes are drilled about 2 in. from the lower edge of the joists and at an angle, as shown in Fig. 5, and porcelain tubes are pushed through from the highest ends of the holes, which will prevent them from slipping out; the wire is then pulled through. In doing this, the coil of wire should always be placed on the floor at one end of the line, so that the wire can be pulled up vertically from the coil. The inside end of the coil is used to prevent tangling, as mentioned before. The other end of the wire is anchored as shown in Fig. 6.

Instead of baring the wire and making the connections and splices as you go along, you will find it much more convenient and quicker to allow the ends of the wires to hang loose at these points, and do the splicing and soldering after the wiring has been completed. Peel off all the rubber insulation from the ends and portions to be connected and then scrape the surface of the copper clean with a knife to remove corrosion. Always support the wires with knobs near a splice, to take the strain off the wire, and make a neat open coil or twist, as shown in Fig. 17. This detail also shows the proper method of making connections. Never twist the bare end to form a close coil around another wire, as shown in Fig. 18, as this will prevent the solder from flowing between the turns. The correct method of splicing the ends of two wires together, with a few open turns, is shown in Figs. 19 and 20. After the soldering iron is heated, taking care not to get it too hot, tin it properly and proceed to apply solder to every connection. Apply flux to every connection first to make the solder stick. After soldering, apply the rubber tape and the friction tape to insulate the soldered portions.

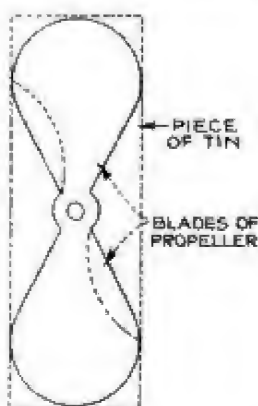
The wiring of the basement can be done, on knobs, at any time later, provided the ceiling is not to be plastered. Otherwise the procedure already described for the first floor is followed. To test the wiring to be sure that it is correct, take two dry cells and connect them in series with a doorbell and to the branch

wires, as shown in Fig. 21. Bring the ends of both wires of every direct outlet together, which should cause the bell to ring if the wiring is correct. If the bell does not ring, there is a break in the wiring at some connection, and this has to be found at once. On outlets operated by a switch, the ends of the wire at the switch have to be touching at the same time the wires of the lamp are touching, in order to close the circuit and ring the bell. On three-way circuits the ends of the wires in each switch box, and also the wires of the lamp outlet are connected in the same way to make the bell ring. After the wiring has been found to be correct, or made so, the preliminary work is completed and the lathing and plastering can be done.

Wiring in barns is very easy to do, as it is all open. On every farm equipped with electricity a yard light is necessary. The wiring to this light is done as shown in Fig. 22, so that it can be turned on or off at both the house and the barn.

Making Small Propellers

Propellers, used for a variety of model and experimental purposes, can be formed from light sheet metal with the aid of a pair of tinsnips or ordinary shears. A strip of material of the desired width and length is obtained and a circle is scribed at each end as shown. The points where these circles touch the long sides of the strip are connected by diagonal lines, the crossing point marking the center of the propeller. Two smaller



circles are scribed around this center, representing the hub and mounting hole. The diagonal lines are now curved somewhat where they join the circles and one edge of each blade may be cut out as indicated by the dotted lines, which are arcs of a circle of a radius not too large in proportion to the length of the blade. Finally the blades are given a slight twist in opposite directions to make the propeller revolve in the wind.—J. S. Hagans, Chicago, Ill.

Small screws can be started easily in difficult places by putting a piece of gum on the end of a match and sticking the screw head to it.

Ridding Public Buildings of Flies

In many schools, stores, churches, and other public buildings, flies become a great nuisance during the summer season. If the building has a ventilating fan, it may be used to advantage to get rid of the flies. Drill a small hole in the side of the fan casing, large enough to admit the nozzle of a vaporizing pump. Shut all windows and doors in the room. Open the top ventilators and close the bottom ones. Now start the fan and fill pump with a good insecticide. Operate the pump and direct the vaporized liquid into the hole. The fan will blow the vapor all over the building and fill the rooms. Don't open the doors or windows for about an hour. This plan has been tried successfully in the local high school.—Wilfred Sorenson, Humboldt, Iowa.

Using Rope as Tire

In an emergency, when the autoist had no spare tire with him and did not wish to ruin the rim by running on it, he improvised a tire from a towrope, which he carried along. After the tire had been removed, the rope was wound around the rim, as shown in the drawing, so that it projected above the rim. Then a length of wire was twisted around both rim and rope to prevent its coming off. The car was driven for a considerable distance in this way without any damage to the rim.



Cleaning Zinc

There are many zinc articles used as kitchen fittings. To clean them, do not use the customary powders. A better way, and one that takes much less effort, is to use a cotton cloth dipped in kerosene. Rub the zinc well and then dry with a clean cloth of the same material. This method has been found very effective.

Seat Aids Gardener and Saves Space

In order to have easy access to every row of plants a gardener made the seat shown in the photograph. It consists of a 12-in. plank with two heavy legs and

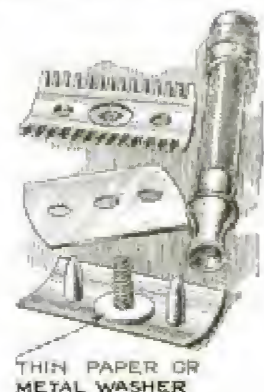


Handy Seat for the Gardener Permits Him to Get At the Plants Easily and to Set the Rows Closer Together

slides, which are also made of 12-in. stock, to make it easier to shift the seat from row to row. Besides the ease of access gained, there is the additional advantage of being able to have the rows closer together, as space for working is unnecessary.—Frank Harazim, New York City.

Improving Old-Style Gillette Razor

If your old-style Gillette razor does not give satisfaction, do not discard it at once. A slight difference in the width of the blade causes it to lie very close to the safety guard, making it too rigid to cut the hair smoothly. Even new blades often seem to be dull. This condition is easily remedied by making the razor adjustable. Place one or two thin paper or metal washers around the middle peg of the razor before putting in the blade, as indicated in the drawing. This gives the blade less curvature and consequently removes the cutting edges a little from the guard, and a greater portion of the blade is free to vibrate, thus insuring greater flexibility and therefore a keener cut. Of course, it reduces the safety somewhat, as the cutting edges are farther away from the guard, but, with care to obtain the proper adjustment and if the razor is applied lightly, this method will give good results and prove beneficial to the skin.—Hatto Tapenbeck, Hollywood, Calif.





Quaint Old Well in Garden Is Both Attractive and Useful

Imitation Well House Is Ornamental Storage Place for Leaf Mold

Aside from being ornamental, an imitation well house will be found useful in a modern garden as a handy receptacle for the storage of leaf mold—so necessary to the successful growing of plants. The house is easily built by the amateur carpenter. Four rough 2 by 3-in. redwood posts are set into the ground in a square measuring 3 ft. across. This space is next inclosed with rough 1-in. boards to the height of 2½ ft., making a roomy bin for the storage of leaves and rich dirt. The four posts are connected at the top with rough 2 by 3-in. stock and a roof is added, which consists of six pieces of 2 by 3-in. rough redwood, cut long enough to make overhanging eaves, each pair being joined in the center to form a ridge, 9 in.

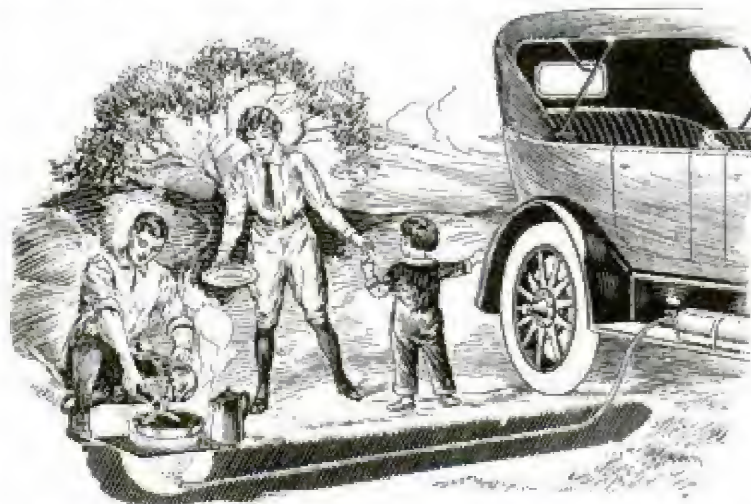
higher than the top of the framework, as shown. The roof is completed by nailing on 1 by ½-in. slats, spaced 2 in. apart. The bucket is a discarded paint bucket of oak and swings on a rope, which passes over a solid wooden wheel, nailed to a "drop" from the ridge, and is tied to one of the posts. In summer, vines may be trained to form a solid canopy over the roof and add to the attractiveness of the well house.—A. May Holaday, San Jose, California.

Eliminating Flat Spots in Painting

It is often rather discouraging for the amateur painter to try to eliminate flat spots, which will cause trouble if left alone, and it sometimes seems nearly impossible. A good, simple method is to apply a coat of linseed oil, brushing it in well to allow as much absorption as possible. Then allow a day or so to elapse before putting on another coat of paint over these spots.—L. H. Georger, Buffalo, New York.

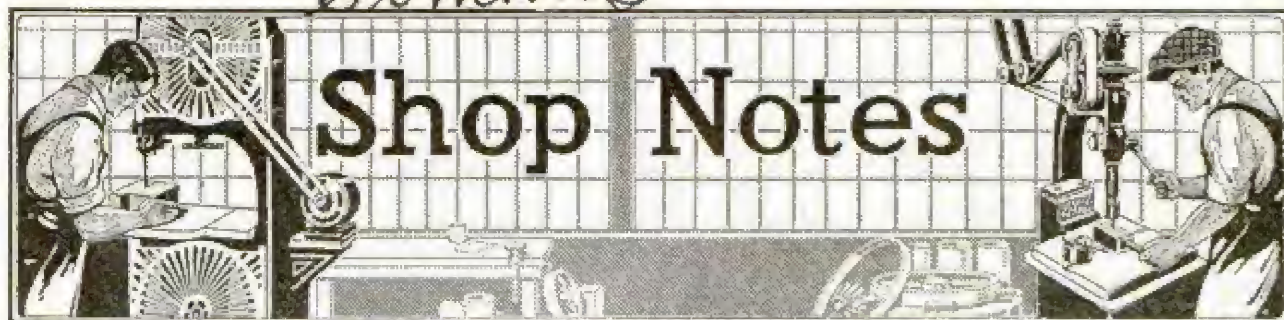
Gas Stove for Campers and Tourists

Campers and tourists who travel where firewood or other fuel is not available can provide themselves with adequate means for preparing meals by carrying a tank of acetylene gas. The tank is mounted on the running board of the car and is provided with a 10-ft. length of rubber hose, which can be extended to reach the fire place of the improvised stove. When making camp, a shallow trench is dug from the car a distance of several feet and terminates in a hole somewhat smaller than the dimensions of the plate which is used to cover it. The hose is laid in the trench and covered, leaving the open end projecting into the larger excavation under the plate. The gas is turned on, making a blaze over which the cooking may be readily done. As long as the plate covers the hole completely, the gas will not ignite beneath it and the rubber hose will not be damaged by the heat.



Novel Method of Cooking with Use of an Acetylene-Gas Tank

Starrett
Diamond



All Shop Notes published in 1925, in book form—Fifty Cents—from our Book Department

Getting Service from the Hacksaw

By JAMES TATE

BECAUSE the hacksaw is such a simple tool, there is a feeling that "anyone can use a hacksaw." While this is perfectly true, there is a great difference between merely using a tool and getting the utmost in service out of it, and even with such a simple tool as this, there is a right and a wrong way of handling it.

There are a few fundamental rules that are imperative, if the proper service is to be obtained from handsaw blades. First, having selected the proper blade, strain it well in the frame. This is important, to insure true cutting and to prevent breakage of blades. The saw is inserted in the frame with the teeth pointing away from the operator (this may seem foolish instruction, but I have seen them put in the other way), and the "hard edge" or flexible hacksaw will be found to need greater tension in the frame than a blade of the "all-hard" type.

For light and medium work, stand at the vise and grasp the saw frame as shown

in Fig. 1, with the forefinger of the right hand pointing along the handle of the frame in the direction of the cut, and holding the end of the frame between the thumb and first two fingers of the left hand (Fig. 2). Start the cut easily, using the same stroke as in filing, and be sure to put on enough pressure to make the teeth bite and not slide over the metal, as allowing the saw to rub over the metal on the start of the cut glazes the teeth and starts the saw on the road to the junk box. After the first few strokes retighten the saw in the frame. Lift the saw slightly on the return stroke so as to prevent the teeth from dragging or rubbing on the work, as any pressure on the return stroke also blunts the teeth. Keep the speed of the strokes to from 40 to 50 a minute, and the work will be cut more quickly and with less wear on the blade than if a faster stroke is used. Where a heavy pressure is required the end of the saw frame may be held as shown in Fig.

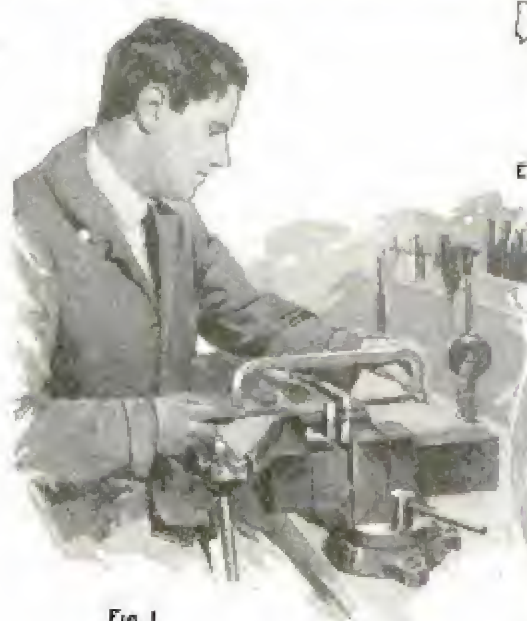


Fig. 1



Fig. 3

EFFECT OF CUTTING TUBING AND THIN SHEET METAL WITH COARSE BLADE



CORRECT



INCORRECT



CORRECT



INCORRECT

Fig. 4



Fig. 2

Figs. 1 and 2, Proper Position and Grasp of Saw for Light Work

Figs. 3 and 4, Effect of Thin Metal and Tubing on Saw, and Holding Work in the Vise

5, all the weight and pressure of the hand being transmitted to the blade through the fleshy part of the hand at the base of the thumb.

In most small shops each man owns his own frame, and there is comparatively little handsawing done; what there is, being on different materials from time to time as necessary in the course of assembly or erection of machinery. In this case, it is naturally impossible for the men to change blades to suit the material to be cut, and a blade is selected that will work fairly well on all material to be

held between two pieces of wood, as in Fig. 6, when sawing it in the vise, and the cut taken right through wood and metal; this helps greatly in reducing breakage. If this is not possible, then



FIG. 5



FIG. 6



CUTTING SHEET METAL

FIG. 7

handled; at least that is what should be done, although the men in the shop may be more or less at the mercy of the purchasing department. The blade selected is usually one with about 14 teeth to the inch, and this will work well on brass, cold-rolled steel, cast iron and tool steel. Even in the small shop, however, there is a decided advantage in supplying the men with a finer-tooth blade for work on thin sheet metal and tubing, one having 32 teeth to the inch being suitable for this purpose. It is an even greater advantage if the blades are kept in separate frames so that they can be picked up and used at once.

Most hacksaw troubles come from trying to cut thin sheet metal or tubing with a blade that is too coarse for the work. Fig. 3 shows what happens to the blade when a coarse-pitch saw is used for this work. For thin metal a blade should be selected having teeth so fine that two or more of them will engage the work at once. If the teeth "straddle" the metal, they will be stripped from the blade. Wherever possible sheet metal should be

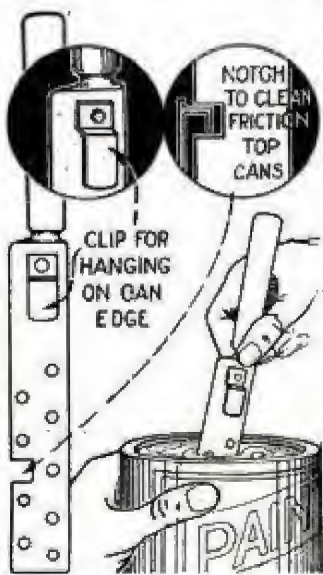
care should be taken to saw through the metal at an angle, as shown at B, Fig. 7. If the metal is so thin that, with the blade at hand, even cutting at an angle will allow only one tooth to bear on the cut at a time, then the sheet should be sawed flat, as shown at A. The main thing to observe is to have as many teeth as possible cutting at once; never less than two and preferably three.

When cutting structural shapes there is a right and wrong way of holding them in the vise. Fig. 4 shows the correct and incorrect methods for two common shapes, and a little study will show how the correct method makes it easy for the blade. The same principle applies to other shapes.

Recommendations of leading saw manufacturers, who have made a study of the art of saw cutting, are: For cast iron, solid babbitt, brass, copper, bronze, aluminum, cold-rolled stock, soft steel, annealed tool steel and heavy structural steel, 14 teeth to the inch; practice differs to some extent, one maker recommending 14 teeth

for solid cold-rolled machine steel, 18 teeth for tool steel, cast iron and brass; for light structural steel, tool steel and hard metals, one recommends 18 teeth and another 24. Both unite in recommending 24 teeth for steel pipe, iron pipe, brass and copper pipe, and conduit, and for thin sheet metals and tubing under 18-gauge, 32 teeth to the inch. Flexible-back saws are not recommended for use in tool steel, cast iron or brass by one maker, while another lists them for use in these metals. However, their recommendations are to be taken merely as a guide, or a basis on which to choose trial blades for any particular purpose, and they are very useful in this respect. In fact, it will pay any hacksaw user to get the literature of the saw manufacturers on this subject, as it contains much practical information on the subject of hand and power sawing as well as charts for saw selection.

Serviceable Metal Paint Paddle



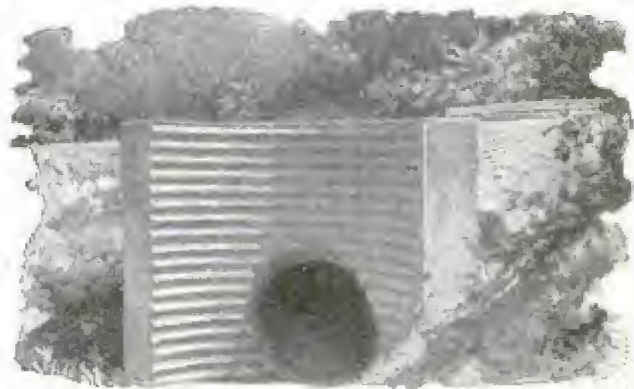
lead or paint remaining under the rim of a friction-top can, can be easily scraped out. To facilitate cleaning, file down all the rough edges before using.

Cleaning Lantern Chimneys

In street work, where many oil lanterns are required for warning signals, the cleaning of smoky chimneys each day is a time-consuming task. A very convenient and efficient method of cleaning a chimney is to scoop in some dry sand until the chimney is half full; then, stopping both ends with the hands, shake it vigorously. The rock particles will scour off all the grime in a few moments.

Forms for Concrete Culverts

Forms for concrete end walls for small road culverts are easily made from a few sheets of corrugated-iron roofing. The



Forms on Ends of Concrete Culverts Made of Corrugated-Iron Roofing

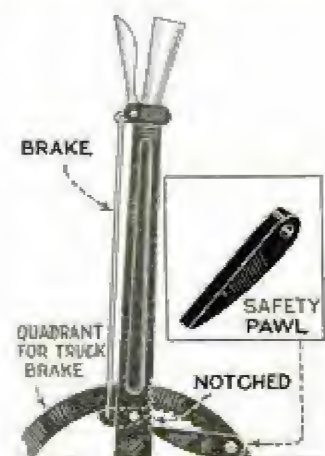
ends of the sheets are nailed to a 2-in. plank wide enough to give the desired thickness to the wall. A hole is cut for the tile and the form is ready to be poured. The corrugations help strengthen the form so that less bracing is required; at the same time the sheet iron permits bending so as to make a semicircular wall if desired, a feature that would require considerable work if a wooden form were used. The form is light and easily handled, and the wavy surface adds to rather than detracts from the appearance of the finished wall.—M. W. Lowry, Athens, Ga.

Safety Pawl on Truck Brakes

While playing in a truck, which was parked on a hillside, two small children

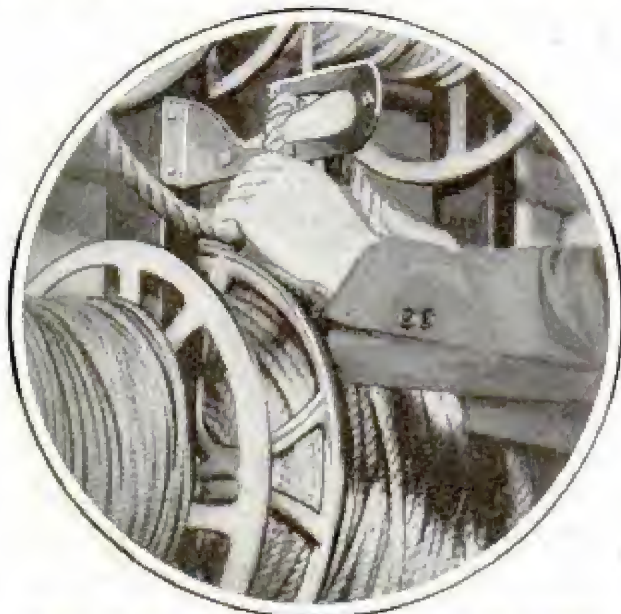
released the brake, allowing the truck to run down the hill with considerable speed and resulting in a smash-up against a tree at the bottom. To prevent a similar accident, the driver put a safety pawl on the brake as shown in the illustration. This makes it im-

possible for a child to loosen the brake, as considerable force is necessary to pull it back to release the pawl. The front lower portion of the brake lever is notched as indicated, and the pawl is pivoted in front of it on the ratchet quadrant.—G. A. Luers, Washington, D. C.



Convenient Rope Cutter

One of the clerks in a San Francisco store has devised a very efficient cutter for rope. It consists of a sharp blade ar-

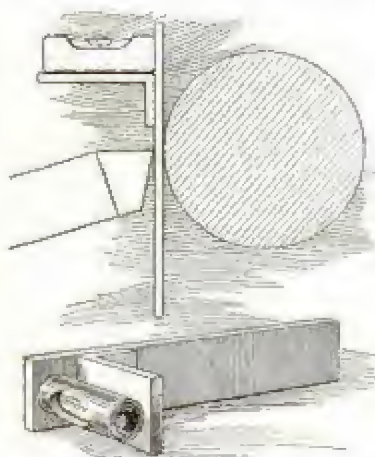


Metal Hook with Sharp Blade Cuts Rope Quickly

ranged on one side of a metal hook. By this means the heavy rope can be easily and quickly cut off by pulling it forward against the sharp blade, as shown in the accompanying photograph. — Charles W. Geiger, San Francisco, Calif.

Tool Setter for Lathe Work

When cutting threads or turning tapers in the lathe, accurate work demands that the exact tip of the edge of the cutting tool be in the same horizontal plane as the lathe centers supporting the work.



To get this setting quickly and with accuracy, the tool setter shown in the drawing was devised. It consists of a rectangular strip of hard brass, to one end of which is attached a short angle strip.

To the angle strip is sweated a length of brass tubing of sufficient size to admit a commercial level glass, with about $\frac{1}{8}$ in. clearance. An angle block is carefully plumbed and the tool setter is clamped to it, plumb in

both directions. A level glass is smeared with a little soft putty, put into the tube and adjusted until the bubble stands central. After the putty has set, the tube is closed up with more putty and the device is complete. In use, a preliminary cut is skimmed off the work to insure its being cylindrical and coaxial with the lathe centers. The tool setter is then placed between the work and the tool, and the latter adjusted. When the exact tip of the tool is dead on the center of the work, the tool setter will stand plumb, with the bubble in the center of the level. The device can be used on cylindrical grinders, thread millers, and like machines. — H. A. Freeman, Willimantic, Conn.

Stopping the Shaft Quickly

Shafting in long lines always carries many good-sized pulleys and the energy stored in these causes the shafts to run for considerable periods after the power has been cut off; longer, of course, when the shaft turns on anti-friction bearings and is well lined up. When a belt breaks

or gets tangled up in another and goes thrashing around, there is urgent need of stopping the shaft before great damage is done, and when the accident involves a human being, there is all the more need for quickly stopping. One



factory has installed the type of shaft brake shown in the photo. The couplings are of the type having smooth outer surfaces and a band brake has been installed on one near the motor driving the shaft. It is an automobile brake with the band altered to suit the coupling, securely mounted so that, normally, it is free from the coupling. But when one pulls on the handle of the rod, which is at a convenient height for applying the whole weight of the body, the brake takes a very effective hold. After shutting off the power, one shaft usually ran 40 seconds before it stopped, but with the brake, it was stopped in 10 seconds.

Stamping High-Speed Drills

Shanks of high-speed drills or end mills are often too hard to stamp after hardening, and if stamped before that process, the lettering may be ground off, as a high-speed mill or drill will bow toward the stamped side when hardened. We take the end mills, after they are hardened and ground on the shank, and give each shank a coat of etching varnish. When the varnish has dried right to be scratched, we place a piece of thin white paper on the shank and roll the stamp lightly over the paper just the same way as is done when stamping soft work, except that the paper is touched lightly over the hardened shank. The letters and figures on the stamp make the varnish on the shank stick to the paper, and strong muriatic acid is then applied to the bare surfaces where it etches the mark. If the paper sticks to the figures or letters on the shank, leave it alone, or apply a little wet acid, which will loosen it. Straight stamping will act the same way, but do not hit too hard. Place the pieces etched in hot soda water to neutralize the acid, and then wash off the varnish with benzene. The shanks can then be oiled.

—W. L. Miles, Warren, R. I.

An Eight-Row Garden Marker

With the aid of the marker shown in the photograph the rows in large truck gardens can be marked accurately and quickly. It consists of a long board with pointed wooden pegs extending from the underside and a handle by which the device can be



Simple Homemade Garden Marker Which Marks Eight Rows at the Same Time

pulled. Bricks are tied on the marker to weight it down so that the pegs will make a deeper impression. As eight rows can be marked at once, the task of marking a large garden is considerably shortened.

Carpet Bumper Protects Door Jamb

A western building-management firm recently offered a prize to any employee suggesting the most efficient means of protecting the highly polished mahogany door jambs while moving furniture in or out of the rooms. The prize-winning device was made of heavy carpet, 4 ft. long and wide enough to cover the jamb properly, as shown in the photo. Three strong spring-steel bands, heavily padded, served to attach the protector to the door jamb.

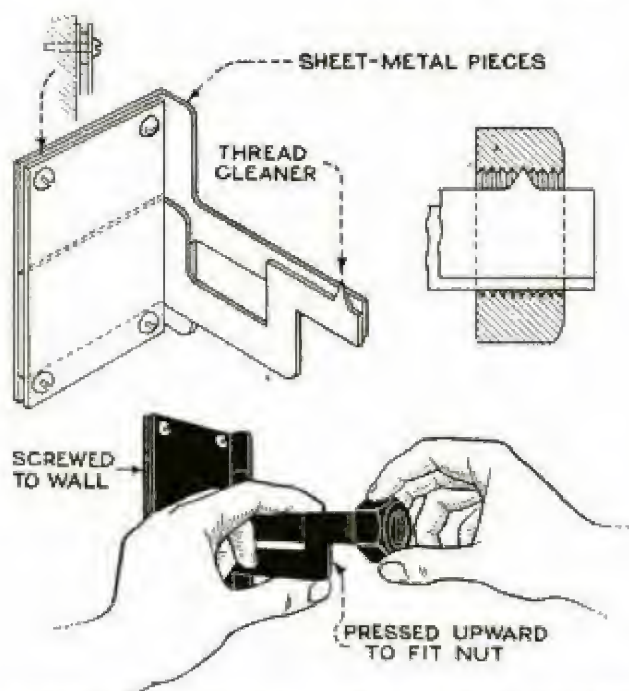


Filling Holes in Brass

Experimenters are often puzzled as to how they are going to get rid of holes in brass castings, etc., which are drilled in the wrong place or which become superfluous as the result of some change or improvement. The following method will do the trick: Fill the holes with solder to within $\frac{1}{32}$ in. of the surface, then file a piece of brass of the same shade as the casting with a medium fine file, catching the filings on a piece of paper. Put the filings in a cup, pour killed muriatic acid over them and leave standing for a few minutes. Then sift them over the solder in the holes so that they can be seen to be a little higher than the surface. Heat is then applied until the solder runs and adheres to the filings. When cool, the surface is sandpapered smooth and polished. This idea works well also on copper or iron castings but not on aluminum. The acid is killed by dropping in some zinc stripped from old dry cells. Both the acid and the filings must be clean and free from other kinds of filings and dust. The holes to be filled must be perfectly clean and tinned right to the top.

Plaster of paris casts can be toughened by boiling in paraffin and polishing.

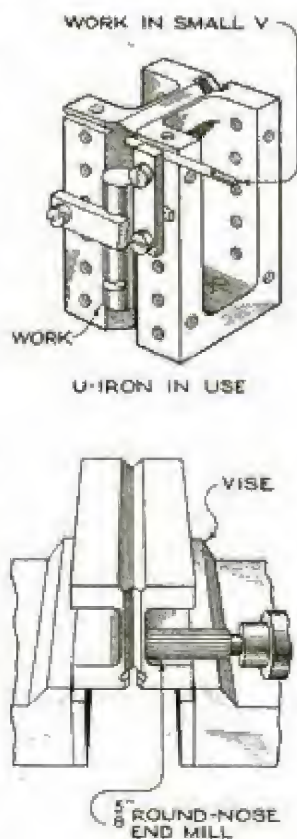
A Tool Makers' U-Iron



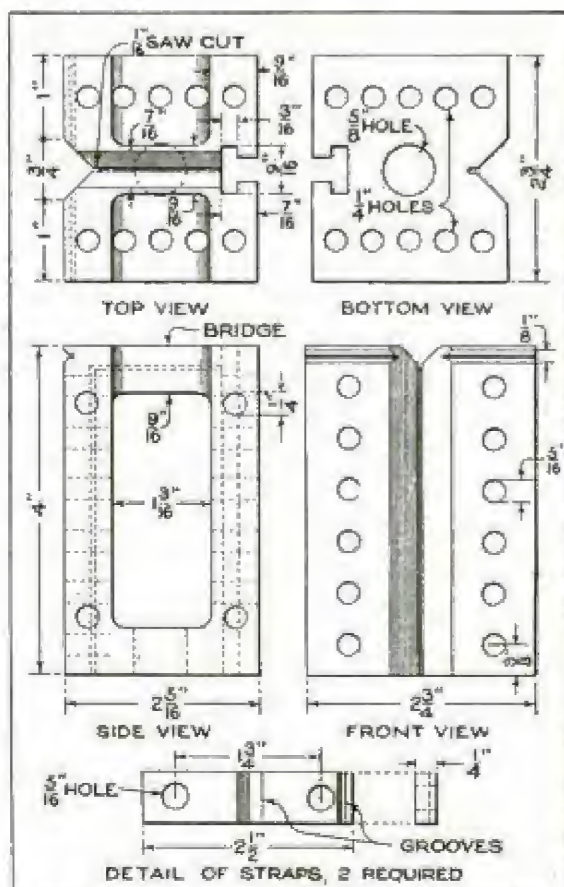
Scraping Out Threads of Secondhand Nuts Is a Quick and Easy Job with This Fixture

Cleaning Out Old Nuts

One of the hindrances to using second-hand nuts is the thick scale or hard paint, lead, etc., which often accumulates in the threads. Using a hand scraper to remove this takes too much time to make it profitable. However, anyone in charge of a small storeroom can make a handy fixture for this work that will do the job nicely in a minimum of time. The accompanying illustration shows the construction. Three pieces of sheet metal are used to make up the scraper. The piece nearest the wall is cut as indicated and bent at right angles; the second is cut somewhat differently, with a V-projection on the top. The third piece is a plain one which holds the completed device to the wall by means of four screws. The scraper here described was dimensioned to clean out any size of nut from $\frac{3}{4}$ in. up. To operate it, the projecting parts are pressed together until the "V" fits the threads and the nut is then turned to scrape out the dirt.—Harry Moore, Montreal, Can.



For taking the place of the ordinary angle plate, the U-iron illustrated will be found a valuable addition to the tool maker's equipment. A block of tool steel is used, which, after the machining operations are completed, is casehardened and ground to the finished dimensions. The block is milled out as shown, for the sake of lightness, with a round-nosed end mill. Turn the work to mill the various surfaces and do not upset the height of the table until you have gone all around the work. Allow $\frac{1}{32}$ in. when taking the roughing cuts for finishing. V-slots for holding either square or circular work are machined at right angles to each other on the edge and top of the block, while a T-slot is milled into the opposite side for bolting the device to the bed of a machine. A third and smaller V-groove is cut at right angles to the one on the front face of the block, for holding work of small cross section. Bolt holes for the clamps are drilled and tapped in the stock at the sides of the several grooves and slots. Two strap clamps of the style illustrated will be needed and grooves are cut into one end and the middle, the better to conform to the work being held and minimize the possibility of its slipping.



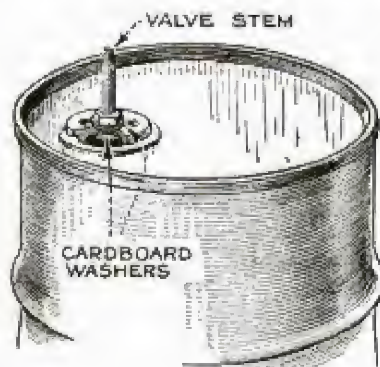
An All-Around Tool Which Takes the Place of the Usual Angle Plate

Crankcase Oil Keeps Mites Away

Poultrymen find it necessary to use some means of destroying red mites especially during the summer months. Formerly coal tar mixed with kerosene was used extensively, but the strong odor is rather objectionable in cities, although its use is permissible on the farm. Worn-out crankcase oil, applied liberally to all parts of the roosts and supports and also to the nest boxes, has been found to be an effective substitute. Only three applications have kept the mites down an entire season.—G. D. Willits, Adrian, Mich.

Saving Gasoline

Finding that our gasoline bill was rather high we started to investigate all possible causes of loss. A number of ways were found to make a gallon of gasoline last longer. Among other losses that were figured was the loss due to evaporation, which was surprisingly large. We had



two 50-gal. tanks, each of which had a small hole in the cover to let in air when the gasoline was drained out. On a warm day one could easily smell the gas as it

escaped through the holes. The condition could not be bettered by making the holes smaller as this hindered the flow of gasoline. The caps were removed and the air holes drilled large enough to receive the valve stem of an old inner tube. Cardboard washers were placed on both sides of the cap and the nut screwed down tightly. No gas can now escape, as the valve remains closed until gasoline is being drained out, when it is opened to let in air.—Jonas J. Byberg, Silverton, Oreg.

Clipping Horses

By clipping the legs and under part of horses in the springtime, the animals will be much more comfortable while working. Mud, which would become incrustated in the long shedding hair of an unclipped horse, can easily be brushed from the clipped animal, while the top coat is sufficient protection from chilly winds and too rapid cooling after a working period.—C. M. Baker, Wooster, Ohio.



Small Platform Hung on Ladder Rungs Prevents Sore Feet or "Ladder Cramp"

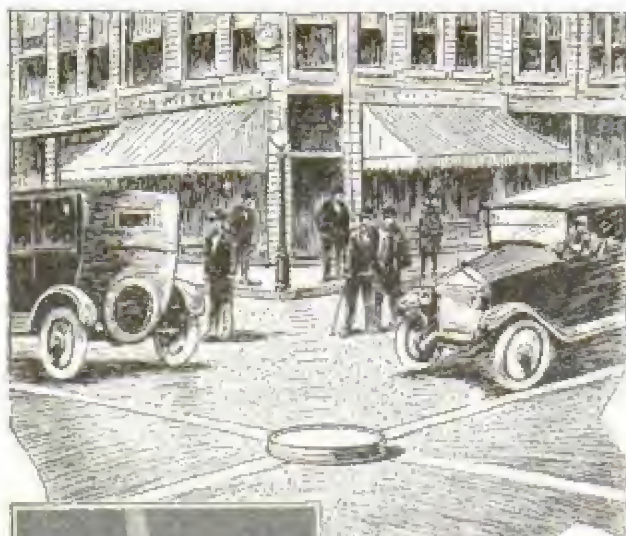
Platform on Ladder Prevents Cramp

A small platform or board, about 10 by 15 in. in dimensions, attached to a ladder, as shown, by means of two $\frac{1}{4}$ -in. iron rods, hooked to go over a rung, will give quick relief to any worker who is troubled with sore feet or "ladder cramp." To prevent splitting, strips should be nailed or screwed to the bottom, as shown. The rods should be about 26 in. long, threaded for at least 2 in., and each one should be provided with two nuts and two washers.

Removing Paint Residue

Paint residue often collects under the edge of friction-top cans having a rim. This can easily be removed with the scraper shown in the illustration. It is cut from a piece of sheet iron to the shape shown and a hole is punched through it to permit hanging it up. It should be made of fairly stiff stock and then it can be used also to remove the covers.





Street Intersections
Marked with Old Auto
Rims Filled with
Concrete

Old Auto Rims Serve as Crossing Markers

In one small Texas town, every street intersection is marked with an old auto rim filled with concrete. Obviously their cost is small compared to that of specially made markers, and autoists will take care not to ride over them for fear of damaging their tires.

Marking Location of Studding for Base Nailing

The illustration shows methods of locating the studding for base nailing, all of which are good, though some are better than the others. Fig. 1 illustrates how the studs are located by sounding, that is, by tapping the wall lightly with a hammer in order to ascertain the exact location by sound. This is the method quite commonly used. However, sounding for every stud is not necessary. When one stud has been located, the others can be found by



FIG. 1

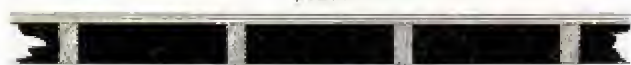


FIG. 2
PENCIL MARK, SCRATCH-AWL MARK, CHISEL MARK, OR NAIL
ON ROUGH FLOOR BEFORE PLASTERING

Several Methods of Marking Location of Studs to Per-
mit Easy Attachment of Baseboards

measurement in the manner illustrated. Fig. 2 shows another commonly used method. Here the location of each stud

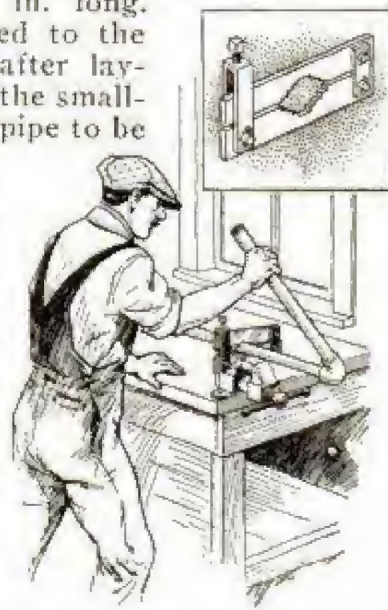
is marked before the plastering is done. The mark is placed directly in front of the center of the stud, on the rough floor, with a dark crayon or a heavy lead pencil. A scratch awl, too, will give good results or the marking can be done with a wood chisel. If the chisel is somewhat dull, the marks will show up better. A lath nail, or other small nail, can also be used for the purpose, driving it about 2 in. from each stud and leaving the head slightly projecting above the floor, so that it can be seen and pulled easily.—H. H. Siegle, Emporia, Kans.

Homemade Pipe Vise Easily Made and Carried

The pipe vise shown in the drawing can easily be carried from one job to another, and can readily be made by anyone with little labor and at small expense. The clamping bars are made from $1\frac{1}{4}$ by $\frac{3}{4}$ -in. flat steel, $6\frac{1}{4}$ in. long.

The jaw is filed to the shape shown, after laying out to take the smallest and largest pipe to be handled. With the stock size given above, the largest pipe that can be handled is the $1\frac{1}{2}$ -in. size. The two clamping bars are held together by 1 by $\frac{3}{8}$ -in. bars and $\frac{1}{2}$ -in. pins, the latter being se-

secured by $\frac{1}{8}$ -in. cotter pins. A piece of 1 by $\frac{1}{2}$ -in. flat steel is bent to fit over the clamping bars and is fastened to the bottom bar with a $\frac{1}{2}$ -in. pin, which is also held in position with cotters. The top of the U-strap is tapped for a standard $\frac{1}{2}$ -in. bolt of the proper length to take in the range of pipe sizes. Two holes, $\frac{1}{4}$ or $\frac{3}{8}$ in. in diameter, are drilled in the bottom bar to enable one to fasten it to a post or table, or it can be used in a common vise. —Frank N. Coakley, Buffalo, N. Y.



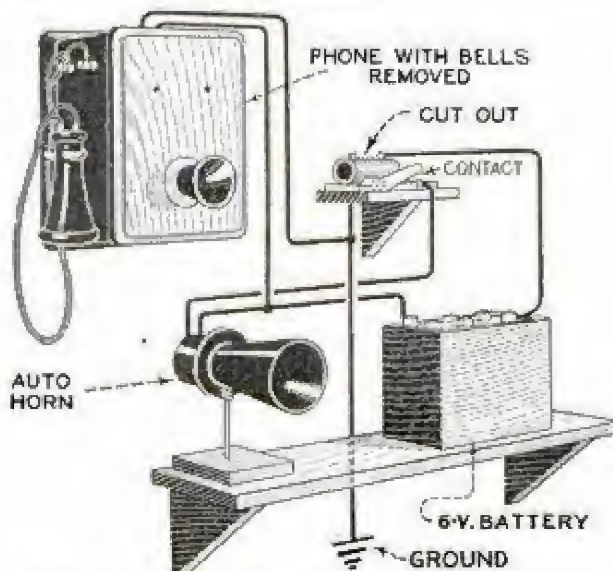
Ⓐ good cutting compound for drilling hardened steel is made by mixing sulphate of copper, 1 oz.; alum, $\frac{1}{4}$ oz.; salt, $\frac{1}{2}$ teaspoonful; vinegar, 1 gill, and nitric acid, 20 drops.

Quieting Turbulent Water

Wave disturbances, or other turbulent water-surface conditions, which accompany the high velocities existing in stream channels below overflow dams, spillways, drops, etc., can be broken up and entirely eliminated, by the use of brush baffles. Large branches of trees, or even whole trees in the case of the larger streams, are cut and placed in the channels, where they are held in place by steel cables run to suitable anchorages. The smaller pulsations in flow, which cannot be damped by symmetrical baffles, because of their regularity, are entirely eliminated by the irregular brush obstructions.

A Telephone That "Honks"

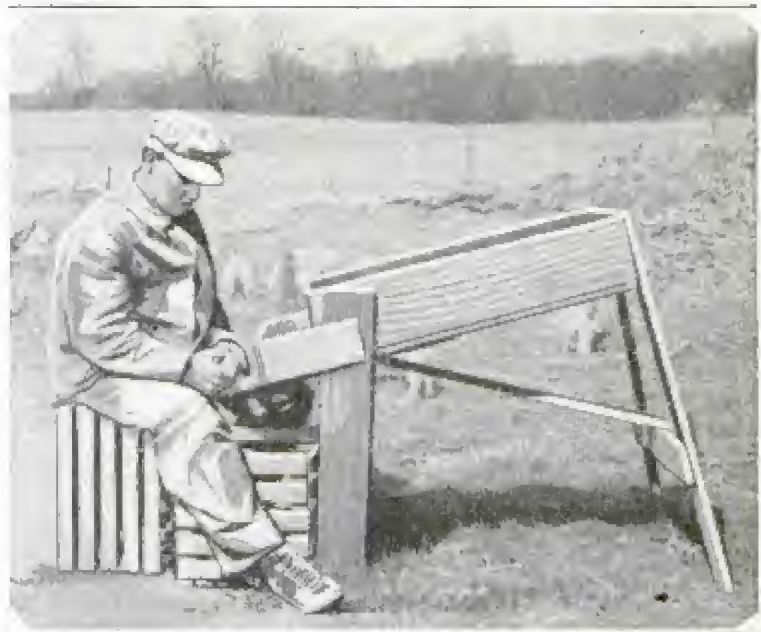
A telephone that honks can be used to advantage in shops where noise prevents the ordinary ringing apparatus from being heard. To make this change on an ordinary telephone the following materials are required: A Ford cutout, a 6-volt battery, a Ford horn of the battery type and pieces of wire. Disconnect the wires leading to the ringer magnets of the telephone and connect them to the cutout, as shown in the diagram. The spring tension of the cutout points should be lessened. When the circuit is closed at the telephone exchange, the cutout is closed, which in turn closes the battery circuit to the horn and causes it to sound. —Mabel Ellis, Richland, Mo.



Substituting an Auto Horn for the Telephone Bell When Loud Signals Are Desired

Cutting Seed Potatoes

To cut seed potatoes rapidly, a box designed to allow the tubers to roll closely onto the operator's hands is used as



Cutting Seed Potatoes Rapidly with the Aid of an Inclined Box Which Facilitates Handling Them

shown in the accompanying photograph. The potatoes are cut so that each piece contains one or more eyes. Thus each tuber must be handled and cut several times. The sloping box allows the spuds to be examined and selected easily for rapid cutting.

Tumble Weeds Burned in Wire Cages

One irrigation district has found that the tumble weeds and miscellaneous debris which collect in the canals at checks, turnouts, bridges, and other irrigation structures, and which must be removed almost daily in order to keep the canals open, can best be disposed of by drying and burning them in huge woven-wire cages. This prevents the weeds from causing further annoyance by being blown back into the ditches or on adjacent farm lands. The cages are placed along the canals at points where the debris collects, and the wet weeds deposited in the cages one day are allowed to dry until the next cleaning, then burned just before the new accumulations of wet material are removed from the canals.

When using a reamer or tap that is too small, cut a narrow strip of tin and bend it over one or more of the teeth to make them take a larger bite. The same idea will work on a pipe or bolt die.

Combined Micrometer and Work Holder

Micrometer holders are handy for many kinds of measuring work, and the one shown in the illustration has an added



feature that makes it doubly useful. It consists of a small table whereon the work can be laid. The body of the holder is made from a piece of $\frac{1}{16}$ -in. sheet metal, bent and cut to the shape indicated. Two large washers, a screw and wingnut, working in a slot in the body, complete the device. The holder is made for use when batches of parts are to be tested. The micrometer is located in the holder in a position that will bring the measuring faces in the center of the work, and the clamping fixture is moved up or down as required to fasten it. Thus, it is only necessary to lay the work on the table on which it is at once located centrally and squarely, making a true measurement certain.—Harry Moore, Montreal, Can.

Homemade Elevator Wings

Wings of a grain elevator loosen quite readily and many of them are lost entirely during a season's run after the third year unless they are overhauled every year. We did not realize this fact until we removed the chain and wings and were surprised to find sixteen of the wings gone. We had but six new ones, so we took a piece of No. 16 gauge sheet metal—the heaviest on hand—and with a compass marked the circles, which were cut out with a $\frac{1}{2}$ -in. cold chisel, using a piece of casting with a flat surface to cut on. On cutting through the sheet, the chisel

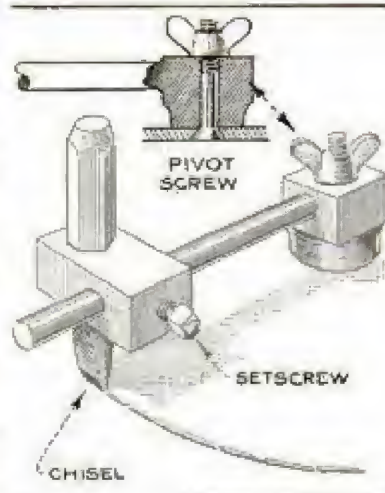
turns down the edge so that, when the wing is completed, it is strengthened considerably by this upturned edge. A washer was placed on the head of the rivet, and we found that these wings, although thinner than the old ones, were just as good.—G. McVicker, North Bend, Nebr.

Marking Triangles for Identification

Many draftsmen lose triangles simply because they have no identification mark on them. A simple but effective method of marking them is as follows: Obtain a heavy writing pen with a new point, and after dipping it in a solution of anhydrous acetic acid, you will be able to write your signature on the surface of the triangle neatly. A little black ink can be added to the solution if you wish the mark to show very plainly. The use of acid alone gives the same effect as if the surface had been sand-blasted.—L. H. Georger, Buffalo, New York.

Cutting Circular Holes in Plate

In boiler making and allied trades circular holes of large diameters must often be cut in heavy plate. This is usually done by first scribing a circle of proper diameter and then chiseling by hand or cutting with an acetylene torch. Where the latter method is not available the work of chiseling can be made much easier by using the tool shown in the illustration. It is a combination of a compass and a holder for the chisel so that the latter can



be guided in a circular path with practically no danger of striking the hand with the hammer. The parts are a center block, a length of $\frac{1}{2}$ -in. iron rod welded to the side of this block and a movable tool holder slipped on the arm and held at any point by means of a small setscrew. In use, a small hole is drilled in the exact center of the hole to be cut, and the screw in the center block is slipped through from the underside and tightened, but not too much, since the center block should turn freely.

Tapping Collets

We had 50 large-sized collets with a $\frac{3}{4}$ -in. threaded hole in the shank end. The hole was hardened and ground and it was then discovered that the thread gauge would not enter. They could not be annealed for fear of spoiling them, so I gave them a coat of oil on the ground surface and cleaned all the dirt out of the threaded hole. The collets had a small part of a drift-key hole break into the threaded hole and I plugged this opening with wax. I then placed the collets on the bench, with the threaded hole up, and poured strong muriatic acid into each hole and let it eat for about five minutes. I cleaned out each threaded hole with hot soda water, to neutralize the acid, and then found that the thread gauge fitted nicely. Acid will not eat the wax. The tap used for finish-sizing on these collets was just a couple of thousandths, or so, small. We have applied the same method on the railroad to eat through a hard scale in order to be able to drill a hole that could not at first be started.—W. L. Miles, Warren, Rhode Island.

Making Potato Hills Pay

Forty-two bushels of good potatoes were successfully harvested from a crate bin, 8 ft. long, 6 ft. wide and 6 ft. high built of 4-in. boards, $\frac{1}{2}$ in. thick, leaving $2\frac{1}{2}$ in. space between the boards. To keep the dirt from sifting out, the bin was lined inside with coarse straw and then filled with alternate layers of manure and soil. The potatoes were planted 1 ft. apart each way, two eyes to a hill, the top layer sloping to the center to prevent water from running off. To make it possible to test the moisture in the soil, a piece of timber, about the size of a man's arm, is put into the center of the bin, halfway down, leaving 1 ft. protruding above the dirt. The moisture condition can be determined by removing the timber and inserting the hand. This should be done each week.—A. I. Hunt, Pasadena, Calif.



Ap 8-Ft. Bin from Which 42 Bu. of Good Potatoes Were Harvested in One Season

Improvised Carpenters' Plumb

For an ordinary level as a plumb on walls, one carpenter got a 5-ft. length of



Plumb Made from a Length of Two-by-Four with Level Set in Slot

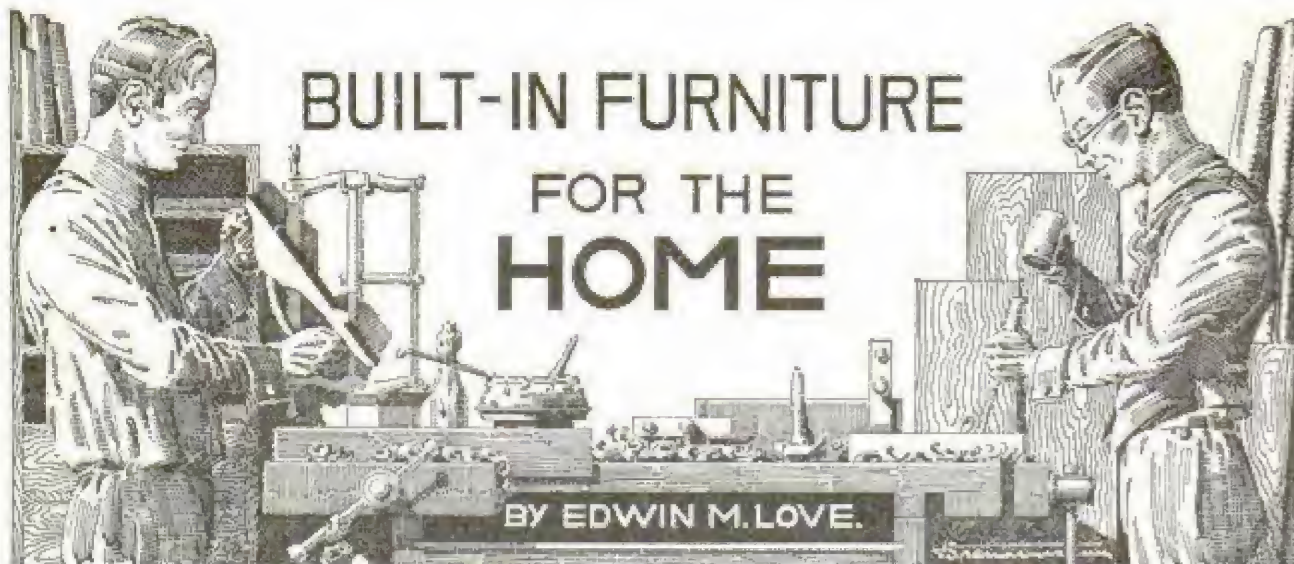


2 by 4-in. stock, smoothed it on four sides and cut a slot out of the center to accommodate the level. Small metal links, pivoted to the wood at both ends of the slot, hold the level in place securely.—R. M. Singer, Chicago.

Repairing an Air Compressor

While repairing an air compressor, rated at about 75 lb., it was found that the pressure hose was unserviceable. As no other pressure hose was available, a piece of ordinary rubber tubing was taken and rolled, for its entire length, in a piece of $2\frac{1}{2}$ -in. adhesive plaster, such as is sold at all drug stores; then it was bound again with a narrow strip of the same plaster, but laid on a bias to prevent the lengthwise strip from loosening. As both ends of this improvised hose were clamped to connections, there was no possibility of its unraveling, and when completed, the hose withstood 100 lb. of pressure.—F. St. Boulanger, Alexandria, La.

275-1. Los Angeles Ave.

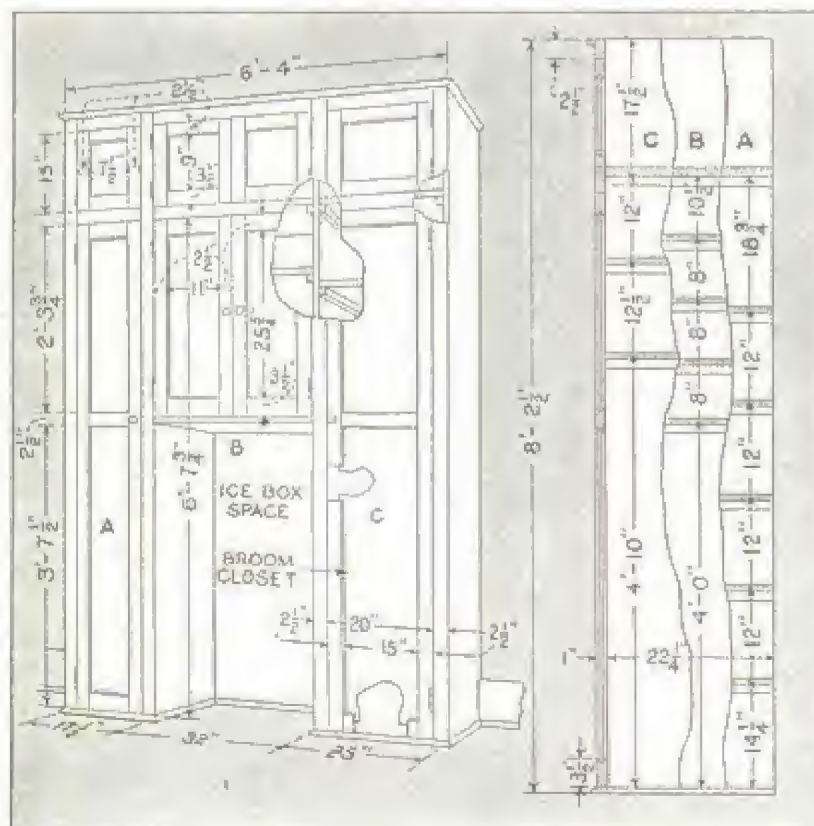


Part XVIII—Laundry-Porch Furnishings

IN the laundry porch there is usually wall space for shelves, and frequently unoccupied space about the icebox that can be put to use. The wall cabinet illustrated provides considerable shelf space, which, being hidden by doors, need not give the cabinet the appearance of a catch-all; and at the right is a closet for brooms, mops and a vacuum sweeper.

The two ends and two partitions are glued up of 1 by 12-in. by 10-ft. stock, the

back for the ends. The left partition line is 1 ft. 5½ in. from the left end, and the other 2 ft. 8 in. from that. Square up the bottom shelves, making one 1 ft. 4 in. long, and the other 2 ft. 1 in., and both 2 ft. ¾ in. wide, deducting the thickness of the baseboard from this, if the latter is already in place. Nail these shelves in position on the floor, so that their ends will form backing for the bottoms of the partitions and end boards. On the wall plumb lines from the bottom shelves as guides in putting up the vertical divisions of the cabinet. Level lines for the tops of the shelf



scraps making four shelves for the left compartment. Cut the longer shelves from 1 by 12-in. by 14-ft. material. On the floor, 1 ft. 11¼ in. from the plaster, draw a line 6 ft. 4 in. long, and square



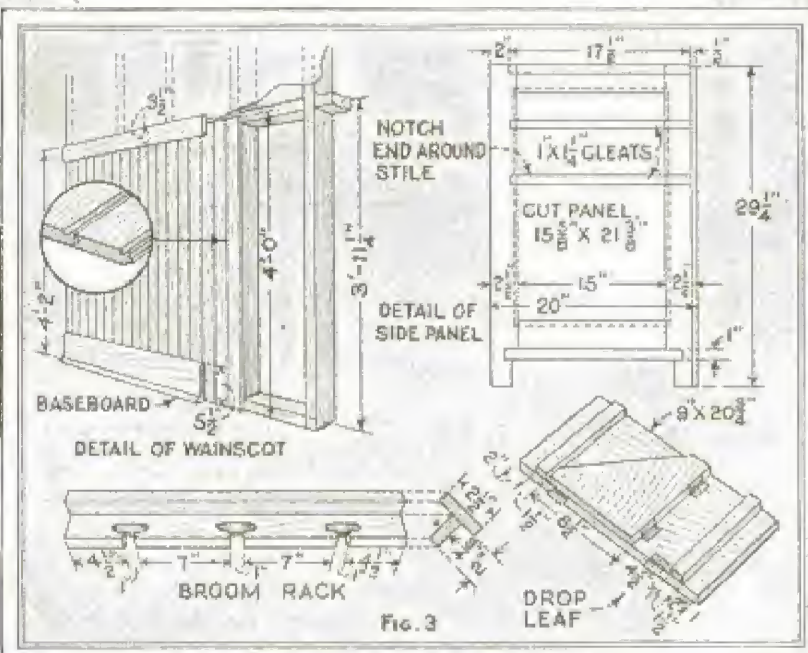
Perspective of Laundry-Porch Cabinet, and Sections through the Compartments

cleats in the left space, starting 1 ft. $2\frac{1}{4}$ in. from the top of the floor shelf, and ranging the next four successively 1 ft. apart. The fifth is 6 ft. $10\frac{3}{8}$ in. above the floor.

In the middle space, the bottom shelf is 4 ft. from the floor and the next three are spaced 8 in. bottom to bottom. The upper shelf lines with the other two. The lowest shelf in the broom closet is 4 ft. 10 in. from the floor to the bottom; the next is $12\frac{5}{8}$ in. above, leaving a 12-in. space to the bottom of the next shelf. Make cleats of 1 by 2-in. stock and nail up to the lines leveled on the wall.



How Wainscoting Is Applied to Wall to Protect Plaster from Water Splashed on It, and Perspective and End Elevation of Broom Rack



End View of Small Portable Laundry Cabinet for Porches Where There Is No Room for the Larger One, and Detail of Leaf

Stand the ends and partitions in place, plumb the front edge and scribe to the walls, keeping all front edges in line. Mark the shelf positions and square from the front edges, nailing on cleats of 1 by 2-in. material, which have previously had the lower inside corner chamfered off. Do not glue, as shrinkage of the boards will open their joints or check them.

Nail up the sides and partitions to their wall cleats, using six-penny finish nails driven into the ends of the cleats, or eight-penny toenailed into studding where such are conveniently spaced. The bottom shelf comes flush with the front of the cabinet.

Glue and nail to the ends and partitions stiles of $1\frac{1}{8}$ in. by 3-in. stock, sized to $2\frac{1}{2}$ in. in width, and cut the upper rails and ceiling rails between. The lower edges of the upper rail are 6 ft. $8\frac{1}{2}$ in. above the floor, so that the upper edges are $\frac{1}{4}$ in.

below the tops of the shelves, making doorstops. The stiles and upper rails of the door are of $1\frac{1}{8}$ by 3-in. stock, sized to $2\frac{1}{2}$ in. in width, with exception of the lock stiles of the left doors of the two pairs, which are finished 3 in. wide, the $\frac{1}{2}$ -in. rabbet giving an outside width of $2\frac{1}{2}$ in. The lower rails are of $1\frac{1}{8}$ by 4-in. stock. Make the panels of $\frac{3}{8}$ -in. three-ply fir on pine veneer, cutting them to the following sizes: Long door at left, upper panel, $8\frac{1}{8}$ in. by 2 ft. $4\frac{1}{8}$ in.; lower, $8\frac{1}{8}$ in. by 3 ft. $8\frac{1}{8}$ in.; short door above, $8\frac{1}{8}$ by $9\frac{5}{8}$ in.; each of long pair, $11\frac{5}{8}$ in. by 2 ft. $2\frac{3}{8}$ in.;

doors above, $11\frac{5}{8}$ by $9\frac{5}{8}$ in.; door of broom closet, upper panel, 1 ft. $3\frac{5}{8}$ in. by 2 ft. $4\frac{3}{8}$ in.; long panel, 1 ft. $3\frac{5}{8}$ in. by 3 ft. $8\frac{1}{8}$ in.; door above, 1 ft. $3\frac{5}{8}$ in. by $9\frac{5}{8}$ inches.

To make the broom and mop rack, cut a back cleat of 1 by 3-in. stock, chamfered on the edges, and to the center of the face nail the 2-in. strip with the grips for the brooms. The latter are made by boring 1-in. holes with the centers spaced 8 in. apart, cutting a section 1 in. long from the stock in front and chiseling straight the stock behind, and chamfering the edges.

Because of the likelihood of water being splashed about on the laundry porch, some form of wainscot to protect the plaster near the floor is desirable. This may consist simply of well enameled plaster, or plaster covered with oilcloth, with a plain wooden band or cap run around the walls 4 ft. from the floor, or the plas-

ter may be removed and 1-in. ceiling put in its place. The drawings illustrate a method of doing this. Take up the baseboard and shoe, and pull the nails out from the back with pliers to avoid marring the front. Four feet from the floor, level a line around the room and remove the plaster and lath below it. Between the studs, with the edge of the plaster as a guide for their tops, nail 2 by 4-in. trimming blocks. Cut 4-ft. lengths of V-groove pine ceiling and nail up vertically, driving them closely together, and bind, nailing into the blocks and the bottom plates. Plumb often, for pieces cut from the end of a stock length are often wider at the freshly cut end than at the other, due to shrinkage, and will tend to make the joints "run" at the top or bottom. If desired, the edges may be coated with white lead to help make them waterproof.

Refit the baseboard and shoe, replacing broken lengths, or splicing on a stud by mitering. Use $\frac{5}{8}$ by 4-in. round-edge wainscot cap for the upper band, coping the corner joints, and double-nailing at every stud with eight-penny finish nails. If the ceiling is thicker or thinner than the plaster, rabbet the back of the cap to suit. To figure the amount of 6-in. ceiling required, allow five widths for every 22 inches.

In laundry porches where a stationary cabinet is impossible, the little portable one illustrated has its uses. The top has a drop leaf on each end, which, when lifted, make a worktable, 1 ft. $8\frac{3}{4}$ in. wide by 3 ft. $7\frac{1}{2}$ in. long.

for the stiles and upper rails, and $1\frac{1}{8}$ by 4-in. stock for the lower rails. The panels are 1 ft. 8 in. in width and 2 ft. $2\frac{3}{4}$ in. long, with the stiles projecting below the bottom rails $2\frac{1}{2}$ in., these being ripped to $1\frac{1}{2}$ in. in width for this distance, to form legs. Using $\frac{3}{8}$ -in. three-ply panel veneer, cut panels 1 ft. $3\frac{5}{8}$ in. by 1 ft. $9\frac{5}{8}$ in. Rip $1\frac{1}{8}$ by 3-in. stock in the center to make drawer-slide cleats, and cut three for each side to a length of 1 ft. $5\frac{1}{2}$ in. Glue and nail one at the top of each side, inside, the back ends $\frac{1}{2}$ in. from the edges of the panels and the front ends 2 in. from the front edges. The others are spaced $4\frac{1}{8}$ in. apart, and are notched around the stiles so as to bear against the panel veneer. These must be square with the face edges of the panels. The bottom cleats are 1 in. longer.

The three drawer rails are of $11\frac{1}{8}$ by 3-in. by 1 ft. 10-in. stock, edges out, doweled to the stiles of the sides and notched around the slide cleats.

The bottom shelf is fitted around the stiles and against the panel veneer, the front edge rising $\frac{1}{4}$ in. above the lower front rail for a doorstep. Nail or screw it to its cleats, but do not glue, though the front edge may be glued to its rail. If a second shelf is desired, install it with cleats in the same manner. For drawer side guides, glue narrow strips of wood between the stiles against the panel veneer to bring it flush with the stiles above the drawer cleats. Cut narrow $\frac{1}{4}$ -in. strips of wood between cleats and shelves at the back, for nailing for the edges of the

Stationary Cabinet	MATERIAL LIST	Portable Cabinet
<p>1 piece, $1\frac{1}{8}$ by 3 in. by 10 ft., pine or fir, S4S, sanded.</p> <p>1 piece, $1\frac{1}{8}$ by 3 in. by 12 ft., pine or fir, S4S, sanded.</p> <p>2 pieces, $1\frac{1}{8}$ by 3 in. by 14 ft., pine or fir, S4S, sanded.</p> <p>2 pieces, $1\frac{1}{8}$ by 3 in. by 18 ft., pine or fir, S4S, sanded.</p> <p>1 piece, $1\frac{1}{8}$ by 4 in. by 8 ft., pine or fir, S4S, sanded.</p> <p>8 pieces, 1 by 12 ft. by 10 ft., pine or fir, S4S, sanded.</p> <p>6 pieces, 1 by 12 in. by 14 ft., pine or fir, S4S, sanded.</p> <p>4 pieces, 1 by 2 in. by 14 ft., pine or fir, S4S, sanded.</p> <p>1 piece, $\frac{3}{8}$ in. by 2 by 8 ft., three-ply, pine or fir, panel veneer.</p> <p>1 piece, $\frac{3}{8}$ in. by 2 by 4 ft., three-ply, pine or fir, panel veneer.</p> <p>8 pair $2\frac{1}{2}$ by $2\frac{1}{2}$-in. loose-pin butts.</p> <p>8 $1\frac{1}{8}$-in. glass drawer pulls (knobs).</p> <p>8 long catches, 2 elbow catches. Cost of materials, about \$28. Time to build, about 30 hours.</p>	<p>2 pieces, $1\frac{1}{8}$ by 3 in. by 12 ft., pine or fir, S4S, sanded.</p> <p>2 pieces, $1\frac{1}{8}$ by 3 in. by 14 ft., pine or fir, S4S, sanded.</p> <p>1 piece, $1\frac{1}{8}$ by 4 in. by 2 ft., pine or fir, S4S, sanded.</p> <p>1 piece, 1 by 10 in. by 16 ft., pine or fir, S4S, sanded.</p> <p>1 piece, $\frac{3}{8}$ in. by 2 by 8 ft., pine or fir, three-ply panel veneer.</p> <p>1 piece, 1 by 5 in. by 4 ft., pine or fir, S4S, drawer front.</p> <p>1 piece, $\frac{3}{8}$ by 5 in. by 12 ft., pine or fir, S4S, drawer side.</p> <p>1 piece, $\frac{3}{8}$ by 6 in. by 14 ft., pine or fir, T&G drawer bottom.</p> <p>2 pair, $2\frac{1}{2}$ by $2\frac{1}{2}$-in. loose-pin butts.</p> <p>2 pair, $1\frac{1}{8}$ by $2\frac{1}{2}$-in. hinges.</p> <p>2 pair, $1\frac{1}{2}$ by 2-in. hinges.</p> <p>4 $1\frac{1}{8}$-in. glass knobs.</p> <p>1 elbow catch.</p> <p>1 long catch.</p> <p>Cost of materials, about \$8. Time to build, about 20 hours.</p>	

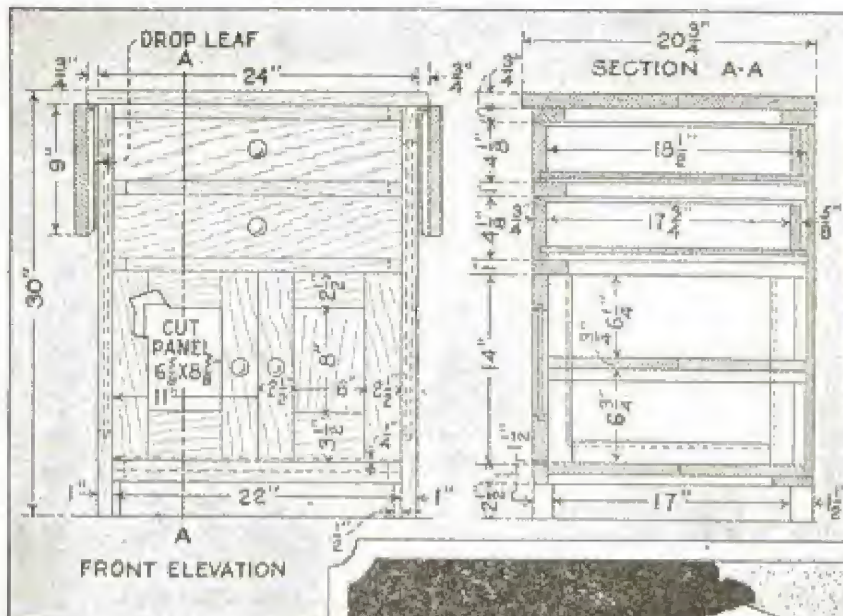
Glue up the top and shelves of 1 by 10-in. stock. Then build the two sides like panel doors, using $1\frac{1}{8}$ by $2\frac{1}{2}$ -in. stock

three-ply back, which is cut 1 ft. 10 in. by 2 ft. $1\frac{3}{4}$ in. It should be glued and nailed with four-penny finish nails. Attach the

top with screws or nails from the underside of its cleats, giving a projection of $\frac{3}{4}$

of the cabinet glue $\frac{5}{16}$ -in. strips to the veneer, to support the brackets full length.

Make the drawers without lips, so that the fronts are flush with the cabinet when closed. Rabbet the $\frac{5}{8}$ -in. sides into the $\frac{3}{4}$ -in. front, and rabbet



in. over the ends and front.

The drop leaves are 2 in. by 1 ft. $8\frac{3}{4}$ in., cut from 1 by 10-in. stock, reinforced against warping by cleats of 1 by 2-in. stock, chamfered on the edges and nailed or screwed 2 in. from the ends. Make a triangular bracket, $8\frac{1}{2}$ by 9 in., for each, and hinge to the underside as shown.

Hinge the leaves to the top with $1\frac{1}{2}$ by $2\frac{1}{2}$ -in. hinges, screwed on the underside. Where the brackets bear against the sides



Perspective, Front Elevation and Section through Small Portable Laundry-Porch Cabinet; Details of the Drop Leaf and Bracket, and End Elevation Are Shown on a Previous Page

the $\frac{5}{8}$ -in. back into the sides.

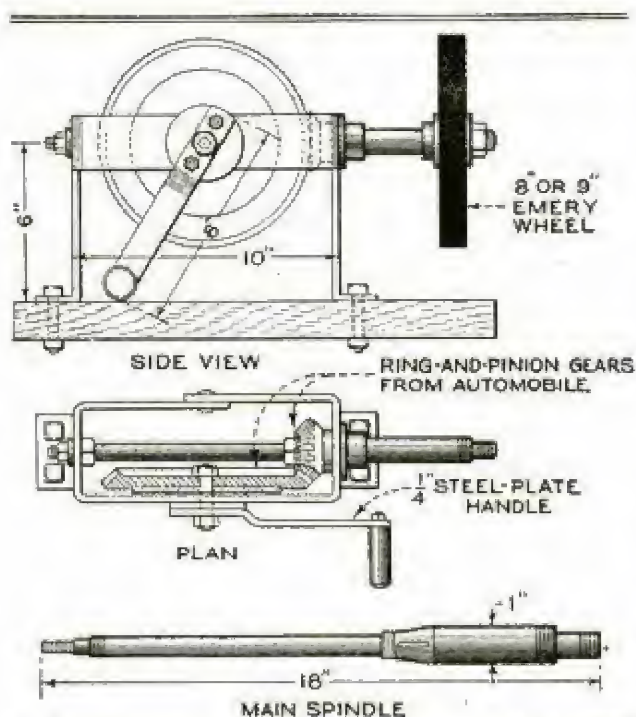
Slide the bottom into its grooves after the drawer is assembled. Build the doors of $1\frac{1}{8}$ -in. stock, making a rabbeted pair.

Guide Grooves for Hacksaw Blades

When using a power hacksaw for cutting short pieces of stock from large round bars, it often happens that the saw will not cut straight, with the result that the pieces are cut too short, unless a large amount has been left for finishing. This sometimes is due to the fact that the saw blade is not put on exactly square, which causes the set on one side of the teeth to wear off quicker than on the other side. A hard spot in the material will have the same effect. If a large number of short pieces are to be cut off, it is a good idea to mark the top of the bar with a chalkline,

keeping the line always on top, and the pieces will all be cut at the same angle. An even better scheme is to first put the bar in a lathe and cut grooves in it about $\frac{1}{4}$ in. deep with a narrow cutting tool. The groove should be about $\frac{1}{4}$ in. wider than that made by the saw blade. The pieces are cut off with a hacksaw, the grooves acting as guides. Care should be taken that the saw blade enters each groove freely.

▮ Abrasion marks can be removed from a print by rubbing it with a tuft of cotton, dipped in alcohol and then rubbed over a cake of bon ami.



Side View and Plan of Mechanics' Bench Grinder Made from Old Automobile Parts

Grinder Made from Auto Parts

Discarded automobile parts can often be used to advantage in making useful tools and devices for the workshop, as, for instance, the hand-operated bench grinder shown in the drawings. It consists of a wooden base upon which the frame is mounted, and mechanism comprising a main spindle, the ring-and-pinion gears taken from an old automobile, and an 8-in. emery wheel.

The frame is made from a piece of $\frac{1}{4}$ -in. steel plate, cut to the shape and dimensions shown. It is cut out flat according to the pattern, drilled at the points indicated and bent at right angles along the dotted lines. The legs are securely bolted to the base with ordinary machine bolts. The spindle is turned down and threaded for nuts at the points shown and fitted with main bearing and thrust rings, made of brass. The shaft for the ring gear and crank is turned down and threaded on both ends, so that nuts

can be screwed on to hold the two parts in place. The crank is made of $\frac{1}{4}$ -in. flat steel, cut and bent to the shape shown, and a handle, consisting of a carriage bolt slipped through a wooden sleeve, is provided on the end.

A grinder made in this way is larger and heavier than the usual type of bench grinders, and with it work can be accomplished that is beyond the range of the ordinary type.

Making Soldering Fluxes

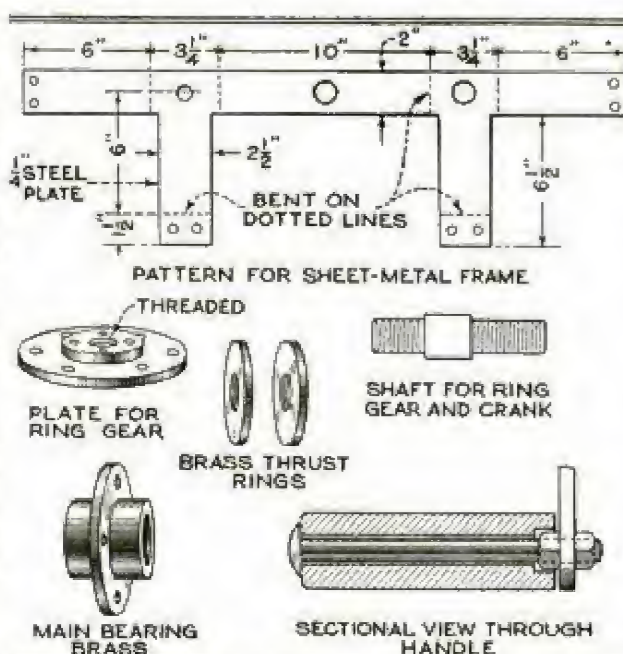
The extensive use of solder for general work in the shop calls for a variety of fluxes suited to the metals that are to be united. As the mechanic works with such metals as copper, steel, cast iron and aluminum, each one requires a different kind of flux in order that firm joints may be made.

The necessity for using fluxes in soldering lies in the fact that the oxide, which always forms to a greater or less extent upon all brightened metal surfaces, prevents the proper joining of the pieces. The fluxes, by removing the oxide, allow the solder to stick directly to the metal.

For soldering electric wires, commutator risers and other copper-soldering jobs, a flux should be used that will not corrode the metal as a result of electrolytic action. An excellent and easily used flux for this, as well as all other copper soldering, is made by carefully melting equal weights of vaseline and rosin together. The mixture is well stirred when melted, and poured into convenient containers. This flux, when cold, has the consistency of butter, so

that a small particle of it will stick on the joint. As rosin varies in density, it may be found advisable to increase the amount used. Increasing the rosin will also result in a harder flux.

A liquid flux for copper electric wires is made by mixing 5 parts of a saturated solution of zinc chloride with 4 parts alcohol and 2 parts glycerin. The saturated zinc-chloride solution is obtained by filling a bottle half full of hydrochloric acid and then

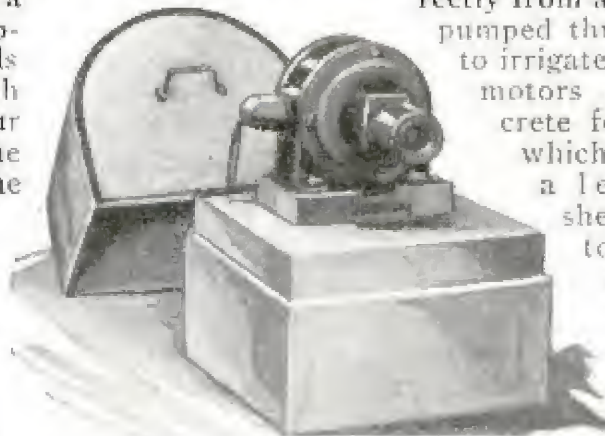


Pattern of Frame and Details of Rings and Bearings

adding small strips and cuttings of sheet zinc, a few at a time, until the acid will dissolve no more. Mix the alcohol and glycerin together and add to the zinc solution. The operation of dissolving the zinc in the acid should be done in the open air on account of the fumes that arise.

For uniting wrought iron and steel, a good flux is made by dissolving zinc in muriatic acid to saturation as described above; then diluting the mixture with twice its amount of water and adding a small lump of sal-ammoniac. The latter assists the solder to adhere, and in addition helps to prevent the soldering copper from corroding. The chemical action of this flux depends upon the fact that muriatic acid unites with iron and steel and in so doing deposits a film of zinc on the materials to which the solder will most readily adhere. In using any acid flux, all joints should be well washed and dried to prevent corrosion.

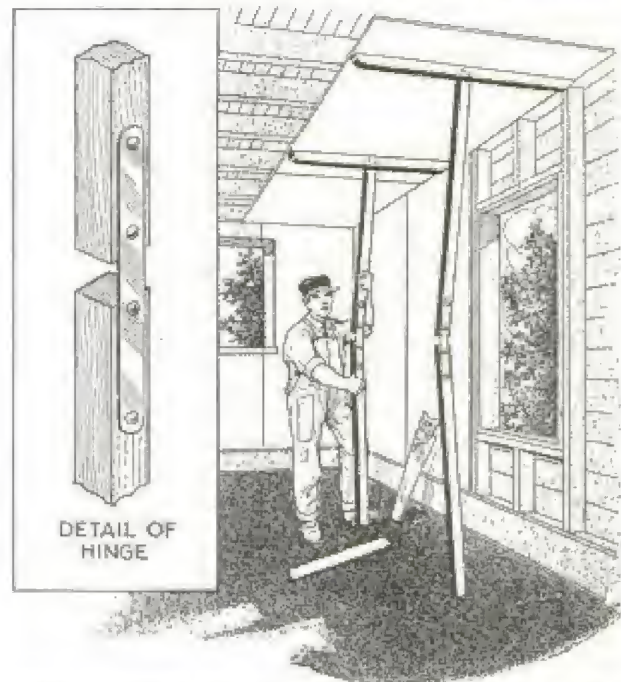
An excellent flux for steel parts, that will not blacken or rust the work, is made from 6 oz. of alcohol, 2 oz. of glycerin and 1 oz. of zinc oxide. Cast iron is a difficult metal to solder so as to make the parts hold, but this can be done easily by brightening both surfaces and coating them with copper. The coppering solution is made by dissolving a few crystals of copper sulphate in a small bottle of water, and is applied with a brush. Copper sulphate, like practically all other metallic salts, is poisonous when taken internally. Aluminum is a metal that offers the greatest difficulty in uniting it either to aluminum or to other metals. However, a solder prepared by melting together 84 parts tin, 16 parts aluminum and 3 parts of copper in the following manner, will be found quite satisfactory. Melt the copper first, add the aluminum a little at a time, stirring constantly with an iron rod; then add the tin and a small piece of tallow. Stand a dry, grooved board upright, stopping the ends of the grooves with wooden plugs and pour the hot metal into the grooves to mold the solder into sticks the thickness of lead pencils. Use an aluminum soldering iron. The flux is composed of equal parts of tallow and rosin; after melting, add half the quantity of zinc chloride.



Protecting Outdoor Electric Motors with Galvanized Sheet-Iron Covers

Fastening Plaster Board to Ceilings

A Wisconsin contractor, who builds many homes wherein plaster board is used, found great difficulty in supporting



Handy Supports for Holding Sheets of Plaster Board against the Ceiling While Nailing Them

without a helper the ceiling sheets for easy nailing until he devised the hinged T-supports shown in the illustration. Each support consists of a 4-ft. crosspiece and a 10-ft. standard. The latter is cut in two pieces joined with a stout spring, as shown. With these supports, one workman can raise a sheet of plaster board to the ceiling and wedge the board in place.

Protecting the Outdoor Motor

On a large country estate several electric motors are used to run pumps for filling and emptying a swimming pool. New water is pumped into the pool directly from a well. The old water is pumped through underground tile to irrigate a citrus orchard. The motors are mounted on concrete foundations the tops of which are recessed to form a ledge, and galvanized sheet-iron covers are made to fit on this ledge as indicated in the photo.

It is claimed that the motors are as well protected from the weather as if they were inside, although they are uncovered when used.

Brush for Garage Washroom

A handy and efficient device for garages, machine shops and other shops where it is necessary to wash one's hands frequently,



Handy Brush Holder in Garage Facilitates Cleaning Hands and Keeps Brush Clean

is a handbrush supported on a bracket. A pair of ordinary handbrushes are mounted on a strip of flat iron, which is bent to clamp loosely around the water pipe at the back of the sink, as shown. The bracket should be long enough to bring the brushes under the faucet, and a band of heavy wire, drawn tight around the pipe below the iron, will support it at the desired height. In use, the brush is swung under the faucet so that the water flows directly on it. In this position, the workman can scour his hands more quickly and easily than is possible when the brush must be held in one hand, and the brush is always clean.—G. E. Hendrickson, Argyle, Wis.

Using Stained Lumber

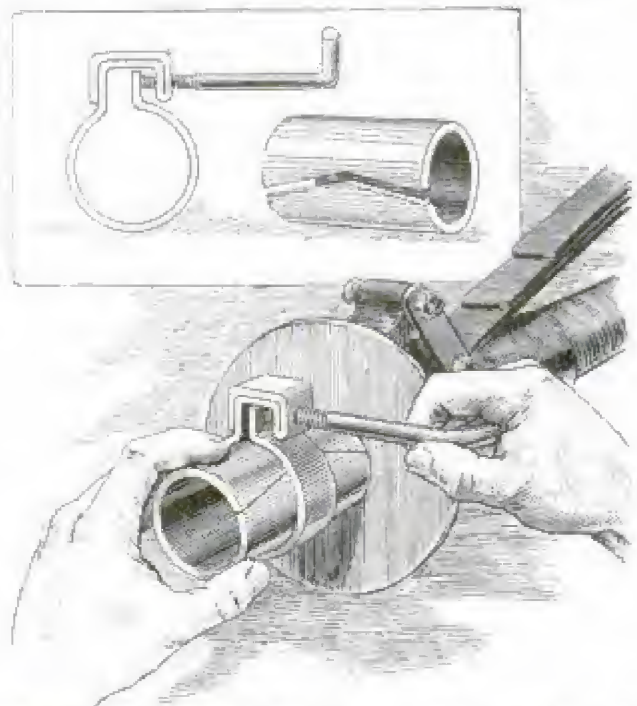
At times during the seasoning process small patches of stain may unavoidably develop in lumber. This discoloration is usually caused by a mold and is not an indication of decay. Numerous tests have shown that stained lumber is entirely satisfactory for painted or enameled woodwork. Lumber containing stains is always less expensive than bright stock, whether it is purchased in the grades admitting it, or in special "stained" grades. Money may be saved by using it in all painted work without lowering the quality of the finished product. Its use is recommended in many houses.

Drilling Rubber

We use rubber in the shop for strippers on punch-press tools, but have always had trouble in drilling smooth or accurate holes in it, until I hit on the following method: If the rubber is to be a tight or friction fit, use a "drill" the same diameter as the piece the rubber is to fit over; otherwise allow for clearance. The drill is a piece of thin tubing, beveled to a sharp edge, all the bevel being inside. Run the drill chuck at high speed with water as a lubricant. The hole will be smooth, and slightly smaller at the bottom than at the top. This method is only applicable to through holes and cannot be used for blind holes.—John A. Blaker, West Auburn, Mass.

Compressor for Split Sleeves

In shops where considerable repair work is done, a tool for compressing split sleeves, which are often used on roller bearings in axles, transmission and drive shafts, is almost a necessity. Such a tool can easily be made in a short time. It consists of a piece of flat iron or steel, bent to fit around the sleeves uncompressed. The ends are formed as indicated in the illustration, one being drilled and tapped

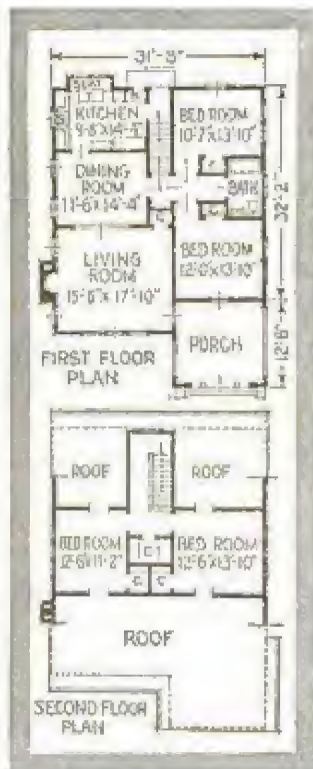


Compressor for Split Sleeves Made from a Piece of Flat Iron and a Screwhook

for a screw, which is used to tighten the device down on the sleeve to compress it.

⚠ It is dangerous to wear jewelry on your hands in a machine shop.

Two Extra Bedroom Bungalow



© Architects' Small House Service Bureau

Plan No. 5A59

QUESTIONS regarding home building addressed to this magazine will be answered by the Architects' Small House Service Bureau of the United States, Inc., controlled by the American Institute of Architects and indorsed by the department of commerce, United States government. Blueprints, specifications and material lists for the bungalow shown above may be obtained at a nominal cost. Inclose self-addressed stamped envelope for reply. If further information is desired send five cents and stamped envelope for a 24-page booklet explaining how the small home bureau functions and showing twelve sample plans.

A FEATURE of the five-room colonial bungalow illustrated here, is the opportunity to provide two extra bedrooms on the second floor, if desired. Dormers can be added to the front, thus furnishing cross ventilation for these bedrooms, or light for the storage space.

The house is of frame construction, with exterior finish of siding and shingle roof, concrete foundations and cement base course. The triple-arch Palladian-motif entrance to the porch is unusual.

On the first floor there is a living room, dining room, kitchen, dining alcove, two bedrooms, bath and porch. The number of closets is surprising, yet there is no waste of essential space.

The house is designed to face south or east, and can be reversed for the other facings.

A fireplace is a feature of the living room. An arched opening separates the dining room from the living quarters.

Home Builders' Questions

Q. We have a three-room house and are thinking of adding two more rooms and excavating underneath the whole house. Will this be more expensive than tearing down the whole building and making a new one? **A.** It will probably be less expensive to make

an addition. The exact answer depends on the condition of the old house. If it is in good repair it would certainly be wise to save it. Do not start the work without an absolutely definite set of plans and specifications. Let the job to a good contractor.

Q. How do you find out how thick masonry walls for houses should be? **A.** City ordinances generally fix the limiting widths. If you have no such ordinance, write to the department of commerce, Washington, D. C., for their pamphlet entitled "Recommended Minimum Requirements for Small Dwelling Construction." Send 15 cents in coin for this. In any case follow the directions of your architect.

Q. Please tell me why we have to re wax our floors so often. They are of oak. They were filled and a little yellow stain was used with the filler. The wax seems to wear out very quickly though we use the best we can buy. **A.** This is unquestionably caused by the fact that you have not used a "sealing coat" to keep the stain from working up into the wax. There are special materials made for this. A coat of shellac does fairly well, but a coat of varnish is vastly better. Clean off the wax, put on a coat of varnish or shellac, then re wax, and you will have a permanent finish.

Q. We have a brick house. After every rain we have water stains underneath the window sills in our house. The paper comes off. I do not believe that there is any chance of this water coming in over the tops of the windows as these places have been examined and there does not seem to be any place for a leak. How can we correct this difficulty? **A.** The water probably comes in underneath the sills. This is caused by their not being properly imbedded in mortar, or not having other devices to form a water bar. A competent brick mason can probably remedy your trouble.

Q. The lower part of my house is finished in wide clapboards, having mitered corners that have pulled apart in a few places. What can I do to remedy this fault? **A.** It should be possible to bring these boards up tight with proper nailing. The joints should then be filled with putty and repainted.

THE PROOF OF THE PUDDING

This letter is to comment on your methods of publishing radio hookups. They are described in a very simple manner so that anyone can understand them. A friend of mine and I built the 3-tube low-loss set described in the Oct., 1925, issue. It was a success with us; the first station we heard was KOA, at Denver. It took us only three hours to build the set, and the following is a list of stations we heard on the first test: KOA, WBAP, WOC, KYW, KMA, WLAW, WHT, WLFB, WDAF, WQJ, WJJD, WHO and WLS.

I think that is a fine start. We found out that the set tunes very sharp, and works well with either storage-battery tubes or the 199 dry-cell type; however, we obtained more volume with the large tubes.—Herman Eulitz and William Schraman, Maplewood, Mo.

I have finished the new 1926 model of the Superheterodyne described in the January, 1926, issue, and find a 1-meg. resistor in the first input clip of the amplifier unit is a decided improvement in my set. I now get Minneapolis at any time during the day. I also got the London, England, station during the International trials, and another station which I was not able to place. The balance of the week reception was poor for some reason and has been bad here for some time now.—Andrew Robbie, Cavalier, N. Dak.

Some time ago you gave me a suggestion as to reversing the connections on my condensers as they differed slightly from the ones you specified in the Perfect-Tone set described in the Nov., 1925, issue. If you remember, I was troubled with body capacity. I wish to advise you that it completely eliminated the interference as soon as done. I wish to thank you very much for the suggestion and assure you that now the set works wonderfully. It seems to use considerable B-battery voltage, but I can remedy that with a B-eliminator.—A. M. Augustine, Normal, Ill.

The Popular Mechanics Superheterodyne Eight receiver has the best tone and reception than I have ever heard in any radio set, and I have heard a great many. Mine is the 1925 model, and the 1926 should be superior to mine except that I added 50 volts more B-battery and put in the new power tube which gave me about the same results as the changes which you made in the new model.

Although I have not sat up at night trying to see how many stations I could get, I have, at the present time, recorded 88 and separated them just about as you state. For instance, Atlanta, Ga., a station at Cincinnati and another one I do not recall, are a distance of only 7 meters apart, all three of them, yet I have separated the three as well as getting a station at Boston, and one or two others which are on the same wavelengths. I have no trouble cutting out Buffalo, which is a powerful station, and getting KDKA at Pittsburgh, which are only 10 meters apart. I have received stations on wavelengths from 217 to 545 meters. My opinion is that I have a receiver second to none regardless of cost.—O. A. Statler, Hotel Statler, Buffalo, New York.

A few months ago I built one of your Popular Mechanics 8-tube Superheterodyne receivers. I am enjoying perfect satisfaction from this set.—R. Grelland, Chicago, Ill.

Nov. 25 you mailed me a blueprint No. 102 of the Perfect-Tone Six receiver. I followed it to a "T," so to speak, sent to Chicago for the "doughnut coils," used all of the parts called for and also used the Acme low-loss variable condensers. I did not stop for cost, but used the best parts I could find. I finished the set Sunday, put it on the aerial and do not find it necessary to change anything as the set is entitled to the name "Perfect." I spent last night getting onto the hang of operating it; there was a slight whistle, but I find I overcome this by turning down my detector tube so low that you would hardly know that it was

lighted. Local stations were on and I plowed through them and got the World Battery Co., Chicago, about 7:45 p.m. I also got Decatur, Ill., Cleveland, Ohio, and New York City, all perfect.—Elmer F. Hornby, Pawtucket, R. I.

I have built the two-tube set described in the May, 1925, issue of Popular Mechanics Magazine, and am much pleased with it. The first station that I got was Denver, Colo., and I then logged 21 stations.—Floyd Hickok, Defiance, Ohio.

I am writing you again with reference to the Four-Tube Loop set described in the August, 1925, issue. I have built the set and have had wonderful reception on local stations; in fact, everyone who has heard it says that it is the best four-tube set they ever heard.—A. F. Hager, Buffalo, N. Y.

A short time ago I obtained a set of blueprints from your radio department and built the 1926 model of your superheterodyne. I have had nothing but the best results from this new model, and I am very well satisfied with it. Perhaps the results I have been getting are partly due to the superamplifier unit; at any rate I cannot conceive of a clearer or easier to operate receiver. I have built the complete machine in a glass case, $\frac{3}{8}$ in. thick. Being in the glass-cutting business, it was an easy matter to drill the holes. The cabinet is rather neat in appearance, and is somewhat of a novelty.—Eldon Simms, Detroit, Mich.

I built the three-tube set described in the September number of Popular Mechanics Magazine, and was successful in getting Cuba on the loud speaker very plain, while local stations were on the air. If anyone wants a good set at a low cost, I recommend that they build this set. The Cuban station I had was PWX.—Vernon Betle, Goose Lake, Iowa.

Your letter in regard to the trouble I had with my radio set received, and the instructions carried out. As soon as I put the 2-meg. resistor in the first input clip of the amplifier unit the set worked perfectly. I want to say that this not only cured the trouble in balancing the set, but it also made the set more selective than before.

Besides, I received stations that I never heard of before, with much more volume on all stations, and this was not due to good weather conditions, as the weather here has been terrible, with lots of static. I will say again that by following your directions, I have the best radio set I have ever heard, regardless of price, and when it comes to tone, there is none that can touch it.—K. H. Bolen, Anderson, Ind.

From May, 1925, with an average temperature of from 120 to 124° F., I heard very clearly on your 1925 Superheterodyne, almost better than I do now (in January) with the temperature at 105°. I have heard Chicago, New York, San Antonio, Mexico City, Buffalo, Pittsburgh, Cincinnati, Zion City and 11 other American stations.—Pochlin Peter, La Cieba, Sp. Honduras.

Here are the results of the B-T set built from your description in the October Popular Mechanics: Beginning at 7:45 p.m. Sunday evening, I tuned in 14 stations on the loud speaker. I am using UV-199 tubes, and compared with my other set, this is excellent. From Sunday to Thursday inclusive, I tuned in 56 stations, the farthest being San Antonio, Tex., 975 miles away.—Andrew Kostolnik, Jr., Louisville, Ky.

I have built the Super-Eight as described in the February and March, 1925, issues of your magazine. It has been working one week and I have had KFI already five nights, besides other Pacific-coast stations. I have had 116 stations to date.—Wesley Thomas, Little Falls, N. J.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid the appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

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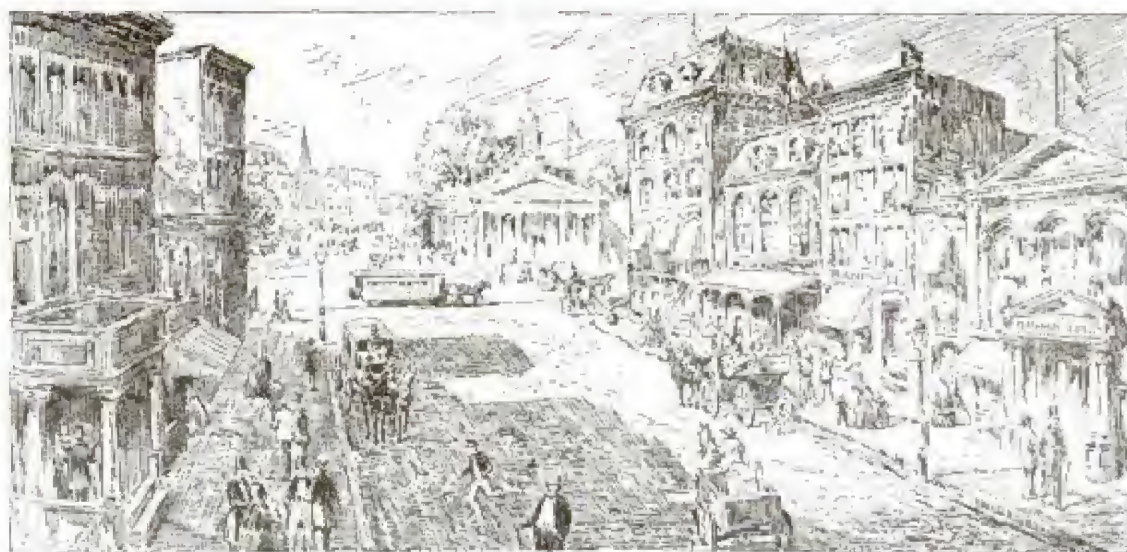
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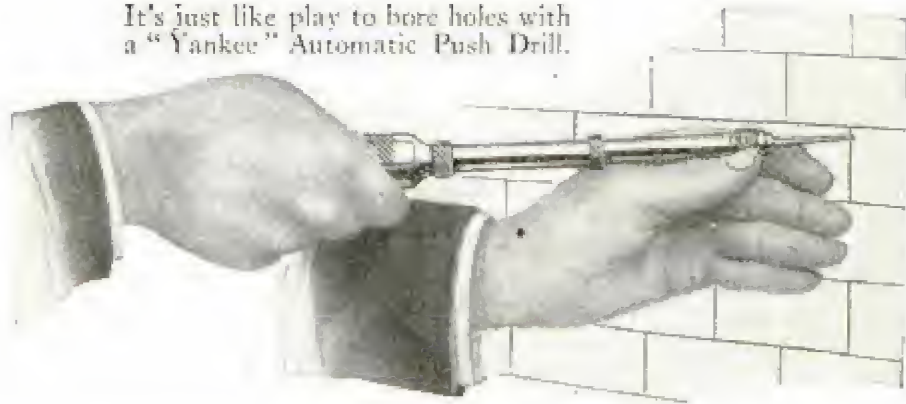


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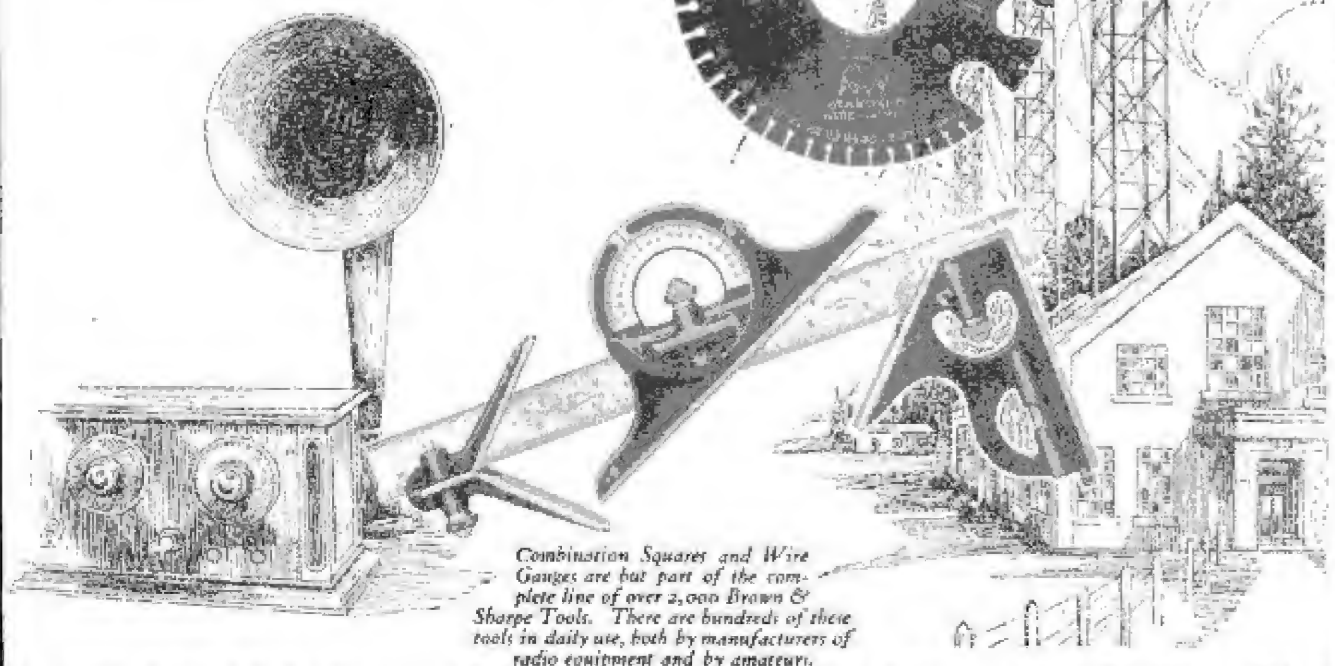
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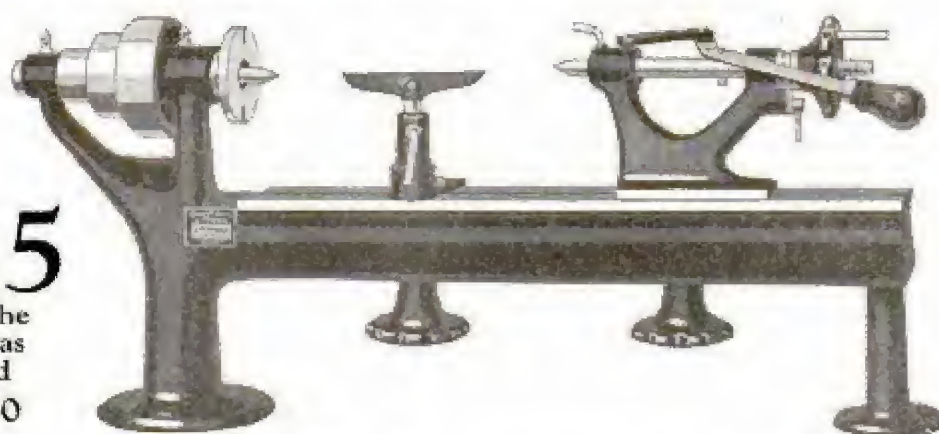
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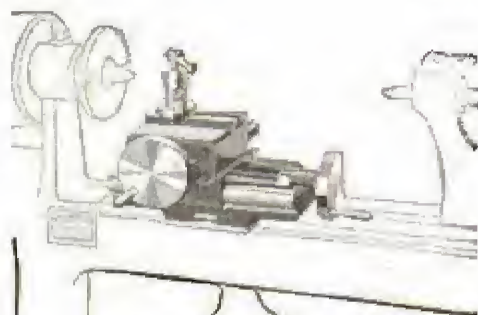


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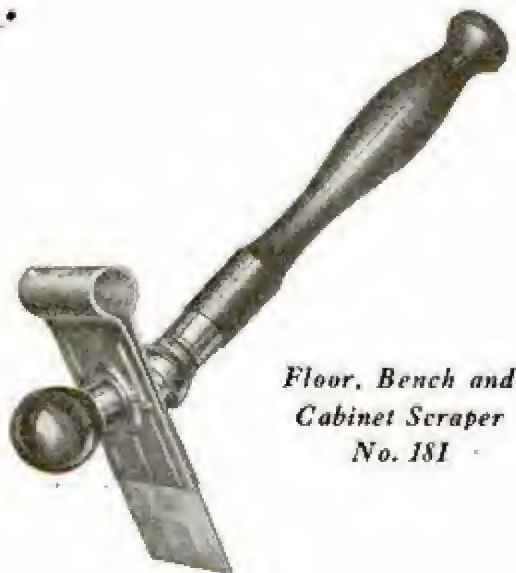


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We think you will like it. Sixty years of soap study stand behind it. The same careful study that made Palmolive Soap the leading toilet soap of the world.

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Illustrated book gives plans and specifications. Save money. Study these facts and prices before you build. Then decide for yourself. Mail postcard today—free book of plans will come by return mail.

LIBERTY HOMES CO.
Dept. E12, Bay City, Mich.



NEW AGENTS SPARK PLUG Visible Flash



Just Out—Amazing Invention—Beacon Lite Spark Plugs. You see the flash of each explosion in the cylinders. Tells which are firing right. Greatest improvement in spark plugs since gas engines were invented. Wonderful gas savers. Agents coining money.

\$90 A WEEK

Easy to make with new sure-fire plans. Sells on sight to every auto owner. Phillips, Ont., writes "Sold 2 dozen today, 3 dozen yesterday. Rush 10 dozen." Write for special **Free Demonstrator Offer** and **FREE** deal to introduce these wonder spark plugs in your territory. Write quick—today.

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Salesmen Wanted



Several live-wire salesmen wanted in every state to sell Carter Oil Gauges to Ford owners, dealers, accessory stores, garages, etc. Our unique sales plan makes it easy for you to get

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Full or spare time—repeat orders with liberal commissions mean permanent, big-paying business. 100,000 Carter Gauges already sold—every Ford car should have one—simple—dependable—quickly attached—fully guaranteed—Big sales campaign just starting—Write or wire for full details.

CARTER GAUGE CO.

604 Webb Street

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21 Jewel Santa Fe Special *on credit*



No Money Down

WE will send this famous watch direct to you, express prepaid, on **FREE** Approval. Examine watch and be convinced it's the best watch buy you ever saw. You save $\frac{1}{3}$ to $\frac{1}{2}$ your money by purchasing a Santa Fe Special Watch. We trust you—wear watch while paying for it.

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FREE With every Santa Fe Special, a beautiful gold chain or strand of exquisite pearls. While offer lasts.

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Clip the coupon, fill out and receive the **FREE** WATCH BOOK. All the newest watch case designs in white or green gold, fancy shapes and thin models, are shown. Read our easy payment offer. Select the watch you would like to see; we will send it to you on approval, express prepaid. Wear the watch 30 days **FREE**. Return at our expense if not fully satisfied.

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Please send prepaid and without obligation your Watch Book Free, explaining your "No Money Down" Offer on the Santa Fe Special Watch.

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This Year—Make it a Real Vacation

JUST an ordinary rowboat—and the Super Elto! Then you have a powerful launch—giving you thrilling, foaming speed—taking you where the big fish wait—furnishing the finest sport in the world for the entire family. The Super Elto is compact—carries snugly on the running board of any car. Light—merely a “one-hand” carry.

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“Starts on a quarter turn” Super Elto



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6 POWER VEST POCKET
TELESCOPE**
with glove leather case \$2

Only 3 1/2 in. long! Easily slips in vest pocket, powerful, precise, adjustable to either eye, 6 full magnifications bring distant objects close in full detail. Thorough satisfaction or money back.
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Only the L. C. Smith Has All These Features:

Ball Bearings at all points of wear and friction (36 of them)
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Ship me the L. C. Smith Typewriter F. O. B. Chicago. I will deposit \$3 with the express agent on arrival subject to 10 days' trial. If I keep it I will send you \$5 a month until the \$69.70 balance of the special \$69.70 price is paid. The title to remain in you until then. It is understood that I have 10 days in which to examine and try the typewriter. If I choose not to keep it, I will repack and return it to the express agent, who is instructed to return my \$3. You are to give your standard 5-year guarantee.

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For Store Fronts, Office Windows, Bank Windows, Office Doors, Panels, Board Signs, Trucks, Automobiles and Glass Signs of all kinds. No experience necessary. Anyone can put them on and make money right from the start without previous experience. All you have to do is to show your samples, the letters are very attractive and easy to sell. Letters costing 4c sell for 25c. One agent says: "Your letters are the best thing I have seen in years. I have made \$125.00 the first week and still going strong." Paul Clark says: "Smallest day \$28.70." H. Gilder made \$835.00 in six weeks.

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General Agents It is easy to appoint sub agents for this line. We pay you 20% cash commission on all orders we receive from local agents appointed by you anywhere. We allow you 50% discount on your own orders. You can sell to nearby trade or travel all over the country as you please. Large demand for window lettering everywhere. **WRITE TODAY** for free sample, full particulars and liberal offer to general agents.

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Makes \$38.75 in Two Days

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Yours truly, A. E. WEINTRAUB, Helena, Ark.

\$25.00 in Three Hours

Gentlemen: Please find enclosed \$7.75 for order enclosed. Times are not good here, and this is a small town. However, I sold over \$25.00 worth in three hours. When I leave here and strike a live town, look out for my smoke. I am more than pleased with results. Believe I can make \$25.00 per day in a good town. Will send for a supply when these are up. Please send these by mail. I enclose extra stamps.

Yours for business,

J. B. TOWER, Portales, N. M.

Takes in \$62.80 in Two Days

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Yours truly,

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The higher the water pressure the more work they do.

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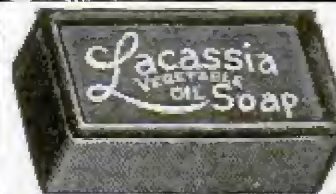
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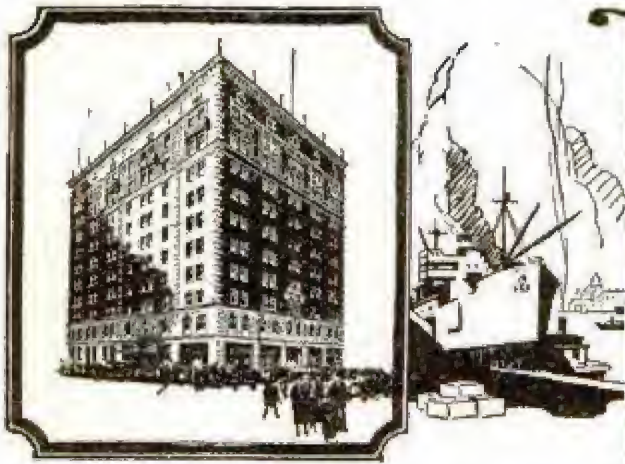
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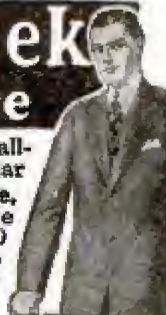
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The sensation of the year. Offering new advanced features in Power, Speed, Control, Weight and Performance. For example—

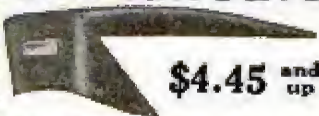
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A high grade 2½ H. P. motor attachment quickly clamped on any bike frame. Speed 4 to 40 miles an hour. 90 to 125 miles per gallon of gas.

Special Low Price Now! Write today for Complete Description and Special Low Prices on Shaw Motor Attachments and the Shaw Complete Motorbicycle. **SHAW MANUFACTURING COMPANY** Dept. 37
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RELIABLE STANDARD MAKES that you can DEPEND on. Enjoy the glorious experience of going wherever you like—when-
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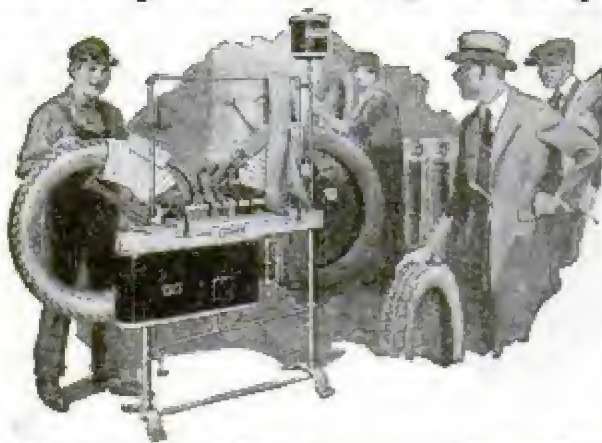
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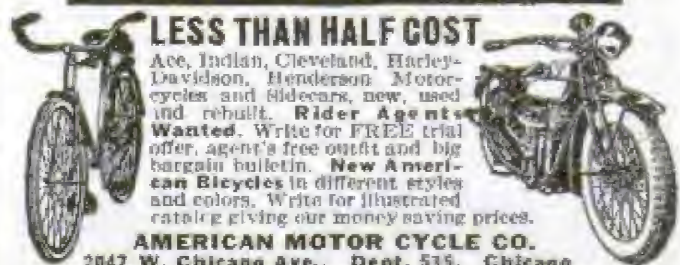


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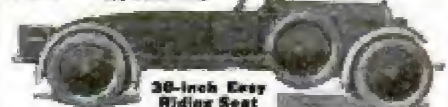
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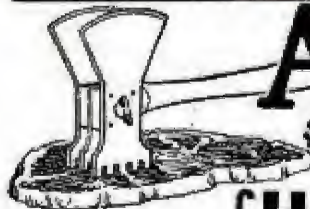


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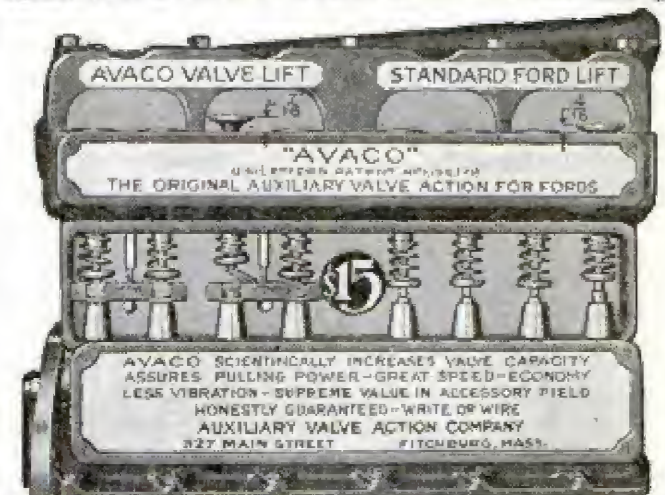
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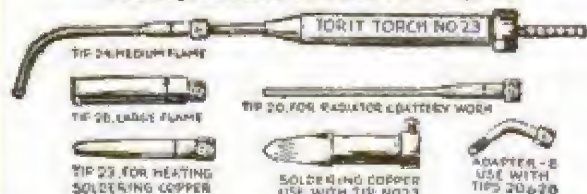
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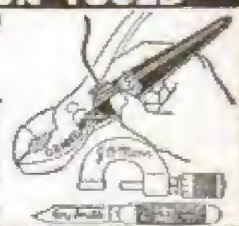
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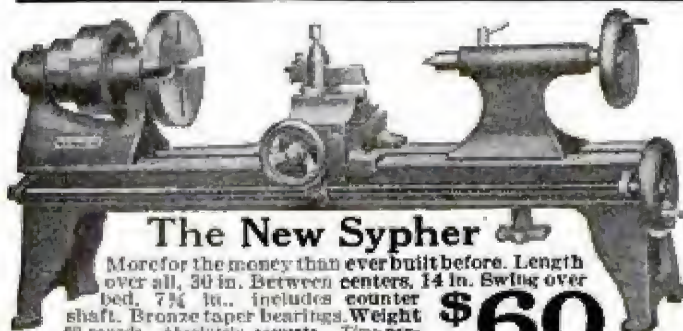
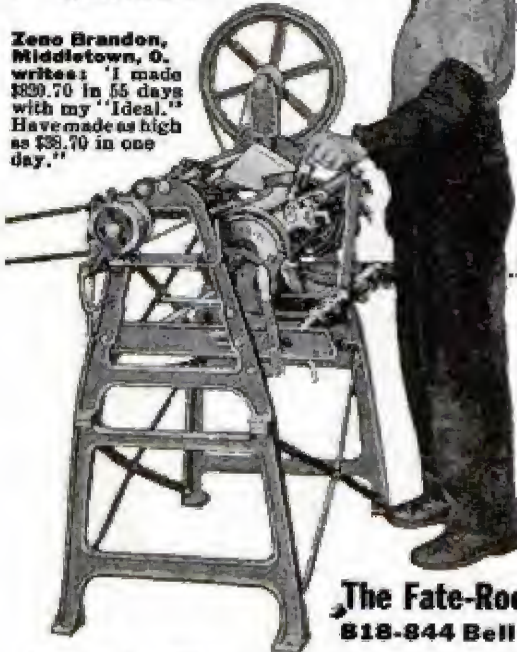
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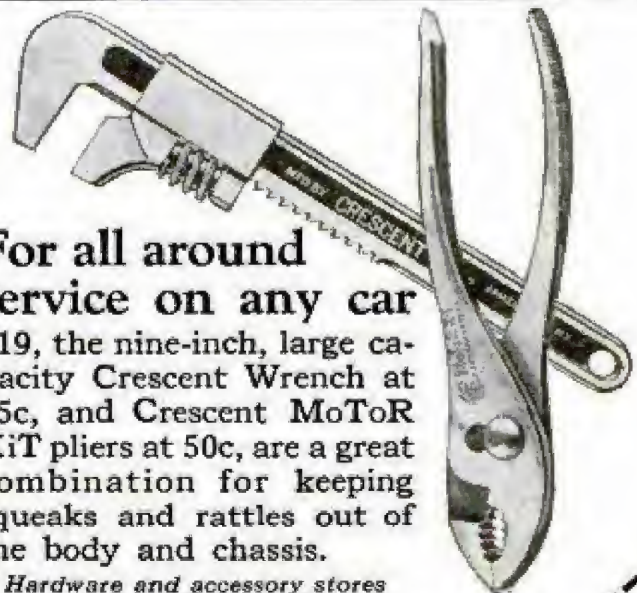
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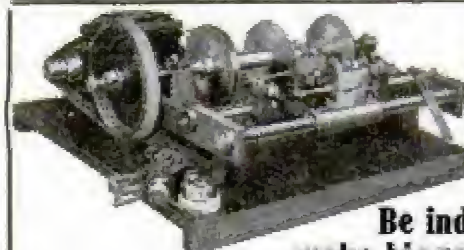


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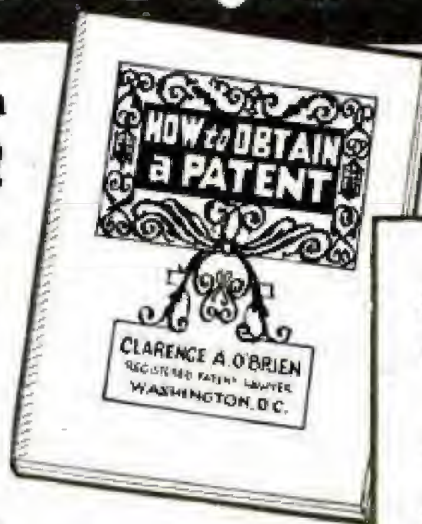
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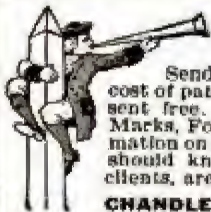
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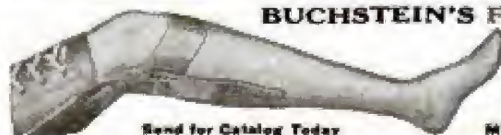
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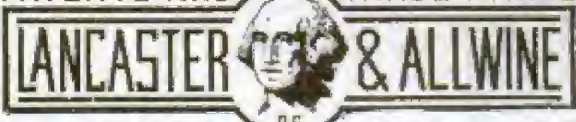


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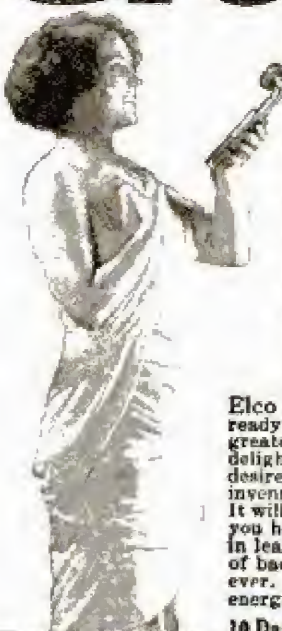
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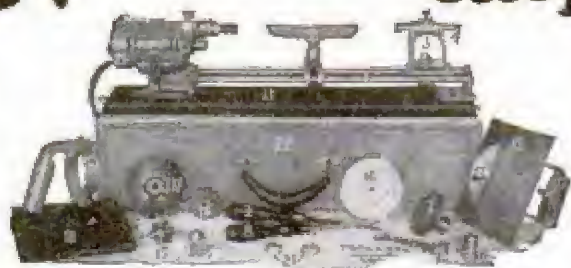
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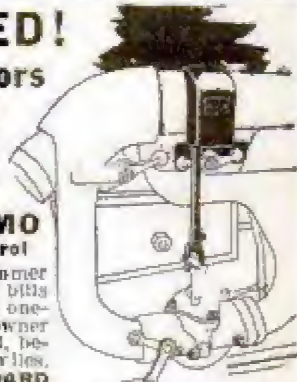
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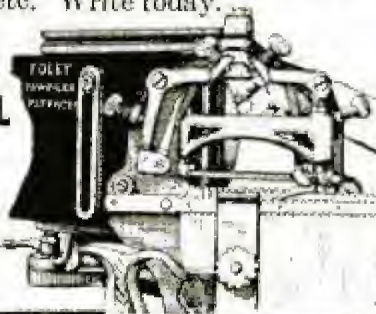
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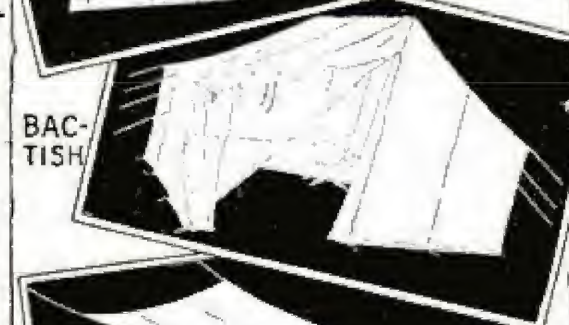
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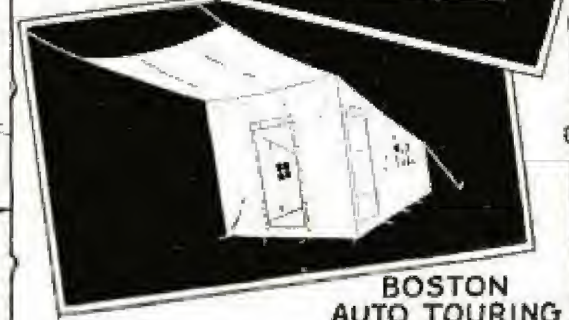
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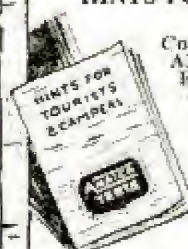
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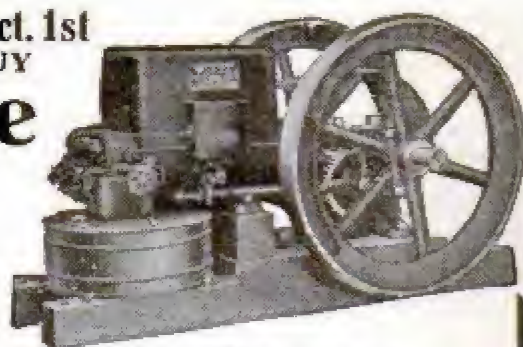
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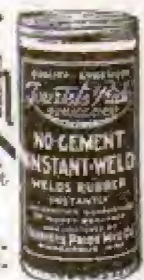
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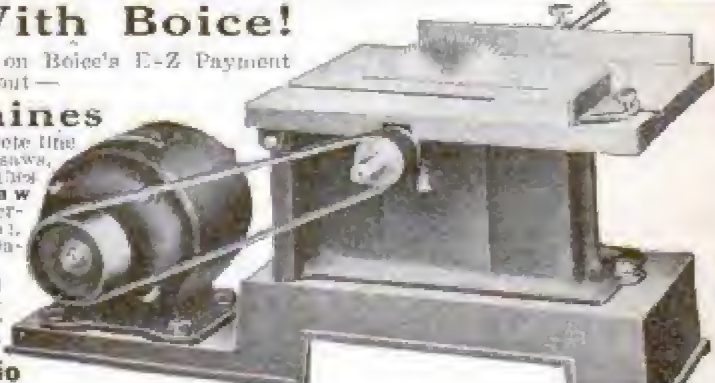


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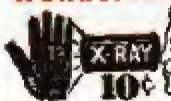
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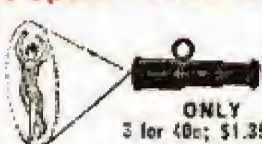
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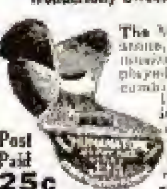
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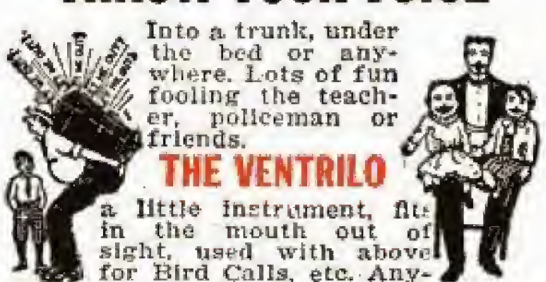
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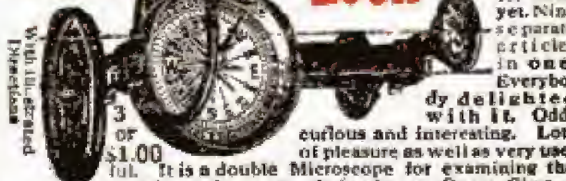
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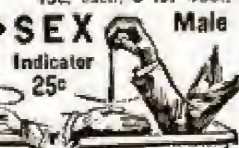


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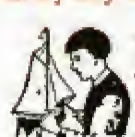


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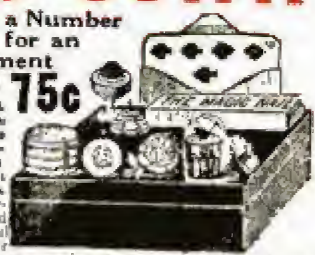
You can easily make a highly sensitive microphone by using this Transmitter Button to collect the sound waves. You can build your own outfit without buying expensive equipment. It is simple and inexpensive. You can record all sorts of your own and hear conversations being held all over the house. You can connect up different rooms of a hotel. This outfit will be used by secret service operatives during the war. It is being used on the stage. It is ultra-sensitive and is the greatest invention in microphones. You can connect the button almost anywhere—wall board holes, stove pipes, still radiators, on the wall behind a picture frame, etc. Button is so light on small it cannot be detected. Persons can be overheard without knowing it. You can listen in on conversations in a neighbor's room. A deaf person in the audience can hear the speaker. Connected to phonograph, piano or other musical instrument, music can be heard hundreds of feet away. Button may be used to receive telephone transmissions; often makes an old line "talk-up" when nothing else will. The ideal microphone for radio use carries heavy messages. Amplifies radio signals. Constantly other similar current and is extremely sensitive. Experimenters and the Button useful for hundreds of experiments along the lines of telephones, amplifiers, loud speakers, etc. Many interesting plants may be devised, such as holding the button against the throat or chest to reproduce speech without sound waves. \$5.00 is given to anyone who sends in a new suggestion for the use of the Button providing the manufacturers find it suitable for use in their literature. **PRICE \$1.00 POSTPAID ANYWHERE.**

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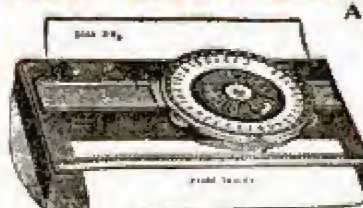
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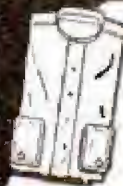


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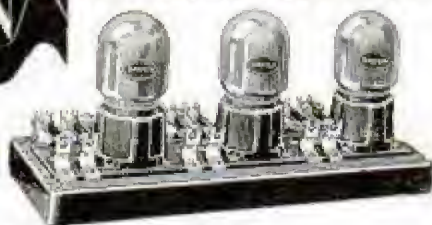
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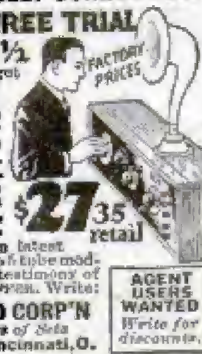
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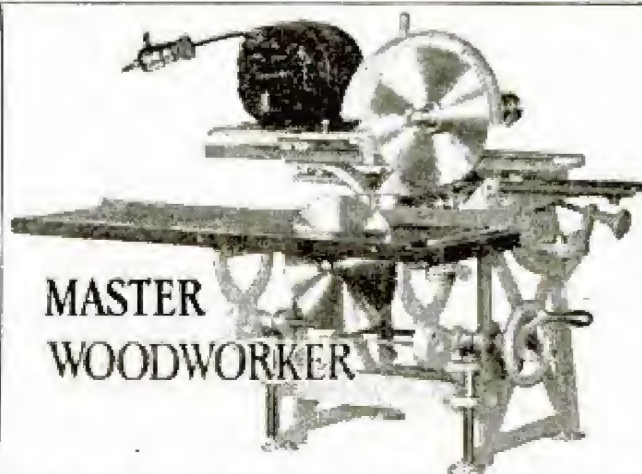
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No Branches



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**Complete Woodworking Shop—
Small Cost—
Easy Payments**

A great opportunity for you to get a complete woodworking machine for home use, factory or construction use.

The "Master" is 12 machines in one. It does cross cutting, ripping, jointing, boring, sanding, dadoing, planing, plowing, mitering, rabbeting, molding, band sawing, mortising, tenoning, grinding, matching and stair routing.

Wonderfully speedy and accurate—sturdy and reliable. Lasts a life time—runs from a lamp socket.

Model No. 10 illustrated, rips 1" stock, cross cuts 2" stock. Three larger models for heavier work.

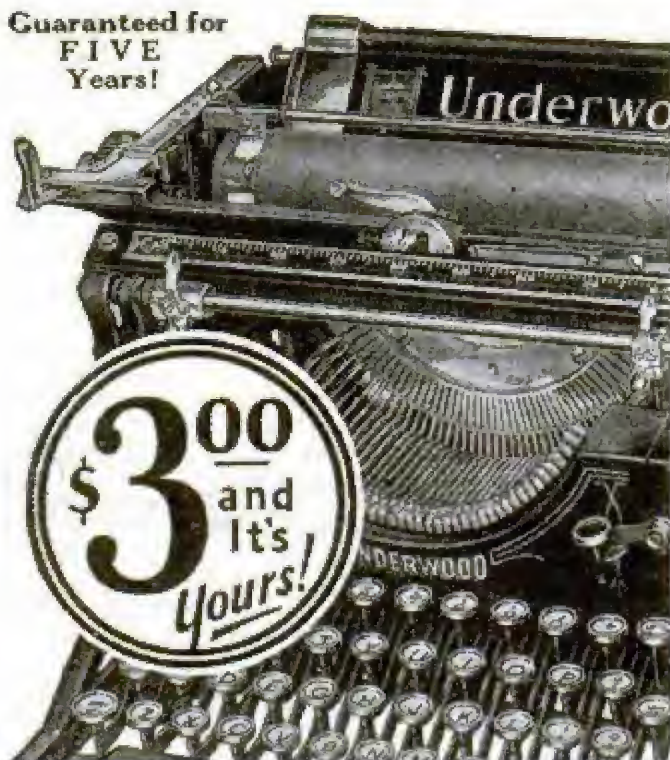
Costs little—sold on easy payments.

MASTER WOODWORKER MFG. CO.
612 BRUSH ST., DETROIT, MICH.

Send for big description book

P. M. 5

Guaranteed for
FIVE
Years!



Why Not OWN a Typewriter?

Here's the machine that big business uses—it's best for you—and our offer makes it the *biggest bargain*. Get a rebuilt, five-year guaranteed Underwood while this lot lasts!

Everyone needs a typewriter; this offer leaves no excuse for not owning your own, standard machine. Try it free. Buy it when you have proved it the greatest value in the field; on liberal terms. Rebuilt from top to bottom, not a worn part in the whole machine. Complete with tools, cover, etc. At a big saving. But you'll have to act promptly!

Manual Free!

Send at once for our catalog. We will send a free manual, too. Full information about the many uses of a typewriter; free course in touch typewriting; many typewritten forms; prices and terms.



SHIPMAN-WARD MFG Co., 1185 Shipman Bldg., Chicago

Without obligation please send new edition of your big Typewriter Book in colors, the free Manual and touch typewriting course offers, etc.

Name.....

Address.....

Send no money Charge it!

A YEAR TO PAY



PA3—Lady's wrist watch latest style solid 14 Kt. gold, highest grade 12 ruby and sapphire jewel movement, life-time guarantee. Featured at \$22 \$2 on delivery—bal. \$1.67 monthly



PA4—Fiery blue white diamond—best quality 18 Kt. white gold—artistically carved, hand pierced, lady's mounting. Featured at \$49.50 \$2 on delivery—balance \$3.96 per month.



PA7—Three large perfectly matched genuine blue white diamonds, two French blue sapphires, 18Kt. white gold dinner ring, exquisite design. Price \$42.50 \$2 on delivery, bal. \$3.38 Monthly



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10 DAYS FREE TRIAL

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Thousands of special valuations genuine diamonds, watches and jewelry illustrated. Your copy sent immediately on request.

No red tape, No delay

Established 1895

ROYAL DIAMOND & WATCH CO.

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Amazing New Seller!

Just Out—Reserve Territory Quick
PUMPING UP TIRES NO LONGER NECESSARY

New Air-tite Valve Cap—two new exclusive features—instant seller everywhere! Doubles tire mileage by preventing under-inflation. Tires pumped up once need never be touched until punctured or worn out. Tested and approved. Ample proof. Convincing testimonials. Easy for you to make.

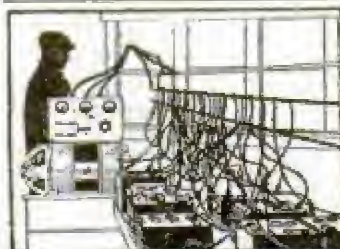
\$25.00 A DAY

Spontaneous demand! Send for Free Sample to use and introduce. Protected territories. Get profit-sharing big money plan. Write today—NOW!

DIRECT-SELLING SYNDICATE

619 St. Clair Dept. 805-G Chicago, Ill.

FREE SAMPLE!



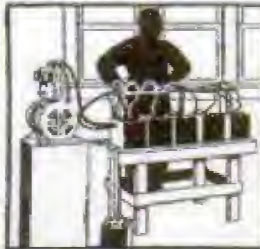
\$150 to \$300 PROFIT MONTHLY EASY WITH ONE DAY BATTERY CHARGING

One Day Battery Charging Pays Big Monthly Profits

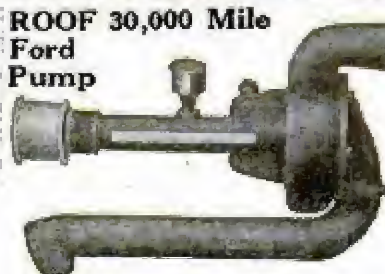
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HOBART BROS. CO. Box M 50 TROY, OHIO

ONLY \$16.50 MONTHLY—PAID BY INCREASED PROFITS



ROOF 30,000 Mile Ford Pump



Increases Ford Power 100%

ROOF overhead valve cylinder head for Ford, Overland and Dodge cars increases power, saves gas and oil, permits 62 miles per hour and more. Easily installed, no motor changes necessary. ROOF 30,000 mile pump gives perfect water circulation. Complete, \$7. Agents and dealers wanted. You easily clear \$100 to \$250 monthly selling ROOF cylinder heads, pumps, steering wheels, etc.

Write for free literature and dealers' discounts.

Laurel Motors Corp'n, Dept. M-5, Anderson, Ind. Established 1917.





**Send for samples
of the business cards
that tear from tabs**

You've probably seen them—they are carried in leather cases, in tabs, from which each card is removed with *perfect* edges. They are always clean and fresh. Thousands of salesmen, executives, and professional people use nothing else.

These cards are made only by The John B. Wiggins Company—producers of high-class business and social stationery since 1857.

Write for samples of what is correct in engraved business cards. A tab will be sent to you free, for the asking.

The John B. Wiggins Company
1167 Fullerton Avenue, Chicago



WIGGINS
Peerless Book Form
CARDS

G-3-26-2

Build a Boat Popular Mechanics Boat Book tells how to make 21 kinds of boats and canoes. Fully illustrated. You can build a boat any time of the year. Many do the building in winter. Price 50 cents. POPULAR MECHANICS PRESS, Popular Mechanics Bldg., Rm. 705, Chicago, Ill.

It's Fun to Make Things of Wood

Our book tells you how to use tools, how to care for them, how to figure a lumber bill, how to make bird box, taboret, umbrella stand, magazine stand, table and cabinet. Many pictures. **Send no money.** Just ask for "Woodworking for Amateur Craftsmen." Pay postman 98c and postage.

Popular Mechanics Press, Room 705, 200 E. Ontario St., Chicago, Ill.

Full auto- matic **DELCO-LIGHT**

Here's something you should know about! A 600 watt, 32 volt electric plant—made and guaranteed by a subsidiary of the General Motors Corporation.

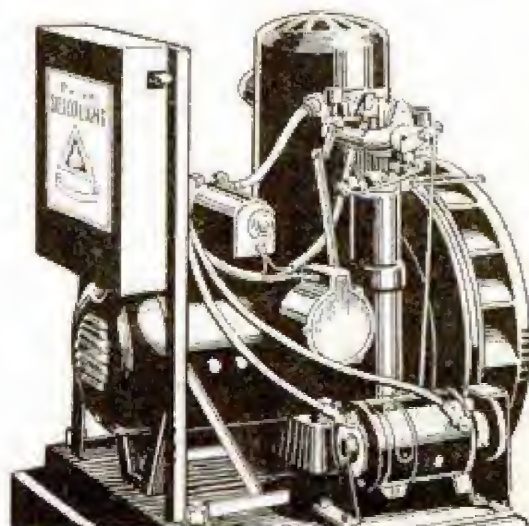
This new Delco-Light starts, runs, stops automatically at the touch of a button. The price is low and the terms are easy.

A small down payment puts it in your home.

Mail this coupon for details.

DELCO-LIGHT COMPANY

Subsidiary of the General Motors Corporation
Dept. Q-4, Dayton, Ohio



DELCO-LIGHT COMPANY
Dept. Q-4, Dayton, Ohio

Please send me complete information about the full automatic Delco-Light Electric Plant.

Name.....

Address.....

City.....Store.....



FOR EVERY HOME at \$1.85

With the "Useful Kit" you have the sizes of Genuine Irwin Auger Bits most needed in every home. Their range of utility is wide—for home repairs, for building many useful articles, and for installation work.

The price for the Set is the same as for the bits purchased separately. The case is free.

Having the Set in a convenient case, protects the bits from rust and abuse. In addition, you always know where to find the size needed. Your bits do not go astray, as they will when kept loose.

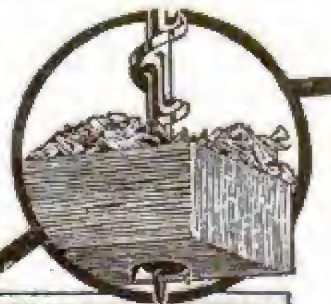
Each bit included in the "Useful Kit" is of the highest grade. All are Genuine Irwin, fully guaranteed. Like every real Irwin Bit, they cut clean holes, clear through, every time, with a minimum of effort. The sizes included are 4-16", 6-16", 8-16" and 12-16".

The Reambor included in each set is a handy tool for starting screws, boring small holes and many such uses.

Ask your Hardware Dealer to show you the Irwin "Useful Kit".

THE IRWIN AUGER BIT CO., Wilmington, Ohio

Hardware dealers everywhere sell genuine Irwin Auger Bits. The Irwin mark shown below is stamped on the shank of every Genuine Irwin Bit.



The IRWIN Bit

REG. U.S. PAT. OFF.

Please Mention Popular Mechanics

KEEPS YOUR CAR FREE FROM RUST SPOTS



only
\$1

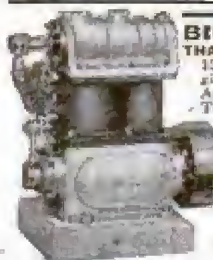
THE BRUSH IS PART OF THE PACKAGE

BERRY BROTHERS' "Handy Andy" TOUCH UP BLACK

Here is a high-quality, jet-black automobile finish that produces an effect closely resembling baked enamel and dries dust-free in one hour. The brush is part of the package—always soft, pliable and ready for use. No motorist can afford to be without Berry Brothers' "Touch Up Black" in the convenient and economical "Handy Andy" bottle. It takes only a moment to cover up a rust spot or scratch and keeps a car looking spick and span. Just unscrew the cover and remove the brush. Don't worry about results. Only close scrutiny will betray your work. If your dealer does not have Berry Brothers' "Handy Andy" Touch Up Black, send us his name and \$1 and we will ship directly to you, prepaid, anywhere in the United States or Canada.



BERRY BROTHERS
Varnishes Enamels Stains
Detroit, Mich. Made in U.S.A.



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128 Pages Illustrated, Small Steam, Gas and Gasoline Engines, Steam Boilers, 1-8 H. P. up, Toy Engines, Rotor Air Engines, Model Air-Plane Motors, Pumps, Air Tanks, Compressors, Blowers, Fans, Lathes, Drill Presses, M. H. P. Marine Engines, Model Loco, Wheels, Trucks, Etc. Rough Castings Engines, Lathes or Drill Press with Blue Prints, Gears, Pulleys, Belling, Model Makers and Machine Shop Supplies. Sent anywhere 25c. Express or Silver (Preferred). Refunded, first order. Reorganized and under new management. Address private correspondence to Carl Smith, Mgr. **MODERN ENGINE & SUPPLY CO., Inc.** 514-A, W. Van Buren St., CHICAGO, ILL., U. S. A.

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GUARANTEED TO PLAY 27,000 RECORDS

**MAKE
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Does away with needles. No more scratched records. Increases record's life. Gives new charm to old records. Saves \$25 worth of needles. Sells for \$2. **SPECIAL OFFER:** Complete sales outfit with regular \$2.00 Everplay for \$1.00. Deduct from first order. Get your Everplay **FREE** and profit too.

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SAY! LISTEN!

A New Pair of Pants Matched
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Just doubles the life of your suit. We can match almost any suit. 70,000 patterns. Sample is sent for your O. K. before making. All made to measure. Send piece of cloth or vest for matching.



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Enclose return postage if vest is sent

trial to Motorists



Free

Amazing New
Auto Invention
-the Marvelous
Wesco-a Boon
to Motorists!

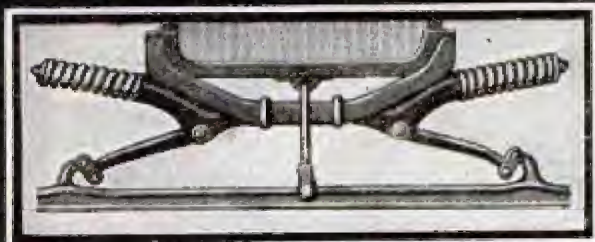
Makes Autos Run 60 Miles to a Gallon of Gasoline!

I don't care what mileage you are making—how many so-called gas savers you have used, I positively guarantee that unless Wesco cuts your gas bills—half or less, removes all carbon, increases power and pep and eliminates spark plug trouble it will not only cost you nothing but I'll gladly pay you for your trouble. Just send name, make and model of car and see "I want to try Wesco at your risk."

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No-Leaf Springs

For Fords



For all Fords—passenger and truck

Delivers perfect cushion-spring action, without friction and without lubrication. Minimizes vibration, guaranteed unbreakable and to outlast the Ford.

DISTRIBUTORS WANTED

A real opportunity to get in business for yourself—unlimited market—will be nationally and locally advertised. Write for full details about distributor proposition.

HAYES EQUIPMENT COMPANY

Michigan Blvd. at Ohio Street,
Chicago, Illinois

World's Smallest Pistol

FREE
25 Shells



It Shoots
Blanks

Actual size—shoots blank cartridges. Makes noise like a forty-five. Harmless. Scare your friends—Everyone buying Betsy.

ONLY \$1.98
Send only
\$1 deposit

Balance C. O. D., plus express charges. **25 Blanks FREE.** Supply limited—Rush order Today! Extra Blanks \$1 per 100.

ARISTO CO. 408 Mallers Bldg. Dept. 102 **CHICAGO, ILL.**

SALESMEN—



What Does Other Men's Experience Mean to You?

The little Giant Lift and Force Pump sells so easily that Mr. Finley (of Indiana) sent me 22,208 orders. Mr. Levin (of Chicago) made nearly \$9,000 in one year. Mr. Luther (of New York) has averaged \$15 a day for five months. Scores of other salesmen are doing nearly as well. Public institutions, schools and colleges, stores, office and apartment building superintendents and home owners buy on two-minute demonstration. The only article of its kind. Pays for itself by saving plumber's bills. Removes all stoppage in waste pipes; prevents noxious gases and disease. So simple anyone can operate. 250,000 already in use. If you are the right man I will give you absolute monopoly in your territory and fix you for life.

Write at once for unusual proposition.

J. E. KENNEDY CORP., Dept. 10-B
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Grab
This
New

Live
Seller
Quick



Amazing New Invention!

EVER since I got stuck in mud up to the axles about a year ago and paid \$25 for towing, I have been experimenting in the perfection of a device which could be quickly locked on the rear wheels to afford powerful traction sufficient to force any car or truck out of mud, sand or snow. The result is my patented

Gets-U-Out Pressed Steel Tire Lug

(Patented—Nothing Like It)

It Gets You Out of Mud, Sand, Snow

Two on each rear wheel does the trick in a jiffy. And it's so simple to slip them on and off, a woman driver can do it easily. Sturdy construction, with nothing to get out of order, my Lugs will last for years. On the market only 30 days, yet hundreds of car owners are already using them successfully.

J. J. Andrest, of Minnesota, says:

"Your Lugs have never failed to pull my heavy 2-ton truck out of deep mud, sand or snow."

\$75 to \$150 Weekly Easy

I don't care if you've never sold before, you'll positively coin money—full or spare time—with this new, year 'round specialty. And it isn't necessary for you to spend your bank roll either. Sells in Sets of 4 at a low price, with 100% profit to you. Every car owner buys

Guarantee

I hereby agree to refund the full purchase price if my LUGS fail to force any car or truck from mud, sand or snow.

ART BENSON

FREE SAMPLE OFFER

Just clip and mail the FREE OFFER COUPON—NOW—and cinch your territory on this whirlwind seller. Act quick.

ART BENSON, Gen. Mgr.

Chicago Tire Lug Company

113-338 W. 47th St.

CHICAGO, ILL.

Art Benson, Gen. Mgr., CHICAGO TIRE LUG CO., 113-338 W. 47th St. Chicago, Ill.

I want to get my share of the big money to be made with your new GETS-U-OUT PRESSED STEEL TIRE LUG. Send me the facts without obligation about my profit and your FREE SAMPLE OFFER.

Name

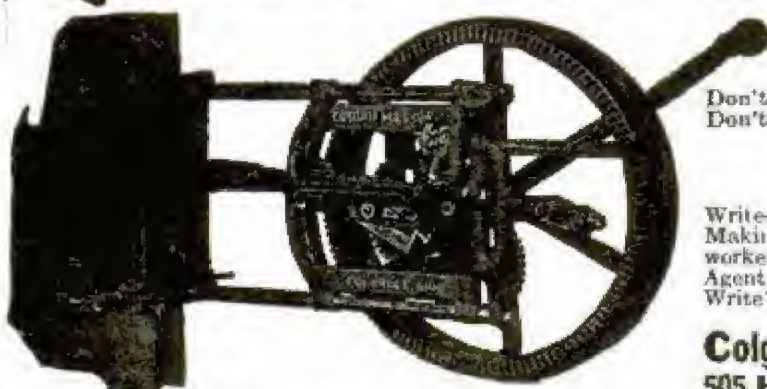
Address

City State

Do You Want *to make* \$50. to \$140. Weekly?

— and we don't mean "maybe." Any man who really wants to get ahead—who has the willingness to do his share of hard work, can make big money selling the Champion Mortiser—a machine that is needed by every Carpenter, Contractor and Builder, Cabinetmaker, furniture repairman, woodworking shop, shipbuilding plants, etc. An almost unlimited field. A practical, thoroughly efficient machine that will cut a perfect mortise of any desired length up to six and eight inches, and any desired depth to four and six inches—and will do this in any kind of wood—cross-grained, knotty, through dowel pins or in toughest lumber. (Notice actual examples shown here.) Easy to operate and dependably accurate and uniform in results. A wonderful time saver and money maker for the man who has mortises to cut. Will do the job three to five times faster than by hand.

Sales Agents Wanted in every country to sell the Champion Mortiser and to appoint and train others. Must be reliable, able to furnish references. Exclusive territory and liberal commissions to right man.



Make Big Money

Don't be satisfied to drift along on a small income. Get into the big earning class! Don't wait for success to come to you—go after it! Don't look for "soft snaps"—Get Busy!

Get Started Now!

Write—Today—for full particulars about this Money Making Opportunity. If you're a carpenter or woodworker, so much the better. You can be an Owner-Agent and double your income on spare time work. Write Today!—then GET BUSY—and KEEP BUSY!

Colgan Machinery & Supply Co.
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Take Your Boat Along!



Fold it up and put it in your auto, or in the baggage car. Or tuck it under your arm and carry it. When you reach the water, unfold it and shove off. That's what you can do when you own an

Acme Folding Boat or Canoe

No other boat like it. Fold or unfold it in 6 to 8 minutes. Thousands in use. The first choice of hunters, fishermen and sportsmen for 36 years. Ideal for camping and outing trips and pleasure boating. Light, strong, safe. Carries enormous loads. Does everything a wooden boat will do—and more. Price surprisingly low. Get all the facts. Write today for FREE catalogue.

**THE ACME
FOLDING BOAT CO.**

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Miamisburg, Ohio

Agents
You
Want
This
Proposition—
Write
Today



Radio Wonder Combination

First combination tube and crystal set ever made. Turn of a switch and either tube or crystal works as desired, or both together. 1600 Miles or more on headphones—Loud Speaker on Locals. Two complete sets in one for only \$19.95 retail. Get my wonderful money making plan and special price to you.

Aerial Electric Co.
128-36 W. Kinzie St.,
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(1) Rush my set prepaid. I will pay postman \$10.95. ()
(2) Send Agents' proposition. ()

Name

Address

AGENTS \$100.00 a Week New Wonder ALL BRASS SPARK PLUG

**Saves Gas
Stops Carbon and**

increases power on any motor. Guaranteed to outlast and out-perform all others. Has 7 features of super merit. Easiest selling Plug on the market. West sold 5 gross one week. Rhodes sold 1,600 first month. Our men average \$100 a week. Exclusive territory to District Agents now. No capital or experience required.

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SELL RIGHT FROM OUR CATALOG**

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Dept. P

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NEW YORK

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Tobacco Habit Banished Let Us Help You

Quick Results

Trying to quit the tobacco habit unaided is often a losing fight against heavy odds, and may mean a serious shock to your nervous system. So don't try it! Make the tobacco habit quit you. It will quit you if you will just take Tobacco Redeemer according to directions.

It doesn't make a particle of difference whether you've been a user of tobacco for a single month or 50 years, or how much you use, or in what form you use it. Whether you smoke cigars, cigarettes, pipe, chew plug or fine cut or use snuff—Tobacco Redeemer will positively remove all craving for tobacco in any form in a few days. Your tobacco craving will usually begin to decrease after the very first dose—there's no long waiting for results.

Tobacco Redeemer contains no habit-forming drugs of any kind and is marvelously quick, scientific and thoroughly reliable.

Not a Substitute

Tobacco Redeemer is in no sense a substitute for tobacco, but is a radical, efficient treatment. After finishing the treatment you have absolutely no desire to use tobacco again or to continue the use of the remedy. It helps to quiet the nerves, and will make you feel better in every way. If you really want to quit the tobacco habit—get rid of it so completely that when you see others using it, it will not awaken the slightest desire in you—you should at once begin a course of Tobacco Redeemer treatment for the habit.

Results Absolutely Guaranteed

A single trial will convince the most skeptical. Our legal, binding, money-back guarantee goes with each full treatment. If Tobacco Redeemer fails to banish the tobacco habit when taken according to the plain and easy directions, your money will be cheerfully refunded upon demand.

Let Us Send You Convincing Proof

If you are a slave of the tobacco habit and want to find a sure, quick way of quitting "for keeps" you owe it to yourself and to your family to mail the coupon below or send your name and address on a postal and receive our free booklet on the deadly effect of tobacco on the human system, and positive proof that Tobacco Redeemer will quickly free you from the habit.

Newell Pharmacal Company
Dept. 300, Clayton Station, St. Louis, Mo.

Free Book Coupon

NEWELL PHARMACAL CO.,
Dept. 300, Clayton Station, St. Louis, Mo.

Please send, without obligating me in any way, your free booklet regarding the tobacco habit and proof that Tobacco Redeemer will positively free me from the tobacco habit or my money will be refunded.

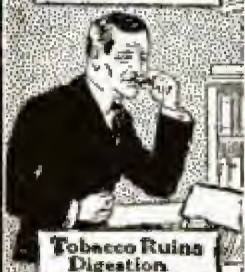
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Street and No.....

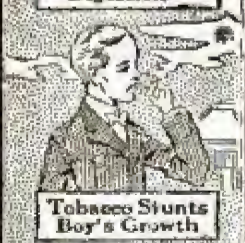
Town..... State.....



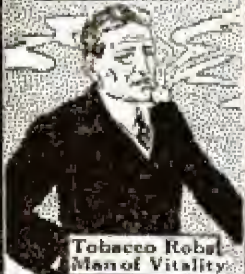
Tobacco Tells on Nervous System



Tobacco Ruins Digestion



Tobacco Stunts Boy's Growth



Tobacco Robs Man of Vitality



Tobacco Steals from You the Pleasures, Comforts, Luxuries of Life



Expert Pistol Shots Say It Is Best—

"To say I am pleased is expressing my admiration mildly." — J. M. BOYTER, Chaplain's Office, U. S. Destroyer Base, San Diego, Cal.

Webley Air Pistol

The Most Accurate Air Pistol Made

Perfects the marksmanship of beginners and expert shots. **NO PERMITS NEEDED**—practice silently at home or outdoors. Shots skirted lead pellets—the only air pistol that guarantees to group within 1 inch at 10 yards. Powerful enough to kill small game.

Looks, Feels and Shoots Like a Fine Automatic

See the new **WEBLEY AIR PISTOL** at your dealer's—or sent direct by mail to you for \$15.00 including cleaning brush and supply of pellets.

Write for Illustrated Booklet "P. M."

Accuracy is insured if special **WEBLEY** Pellets are used—to be had at all dealers.

Made by **WEBLEY & SCOTT, Ltd.**, since 1883 leading British Manufacturers of Shotguns, Double Rifles, Rifles, also new Webley Air Rifle.

We have available for immediate shipment a complete line of all **WEBLEY & SCOTT** Arms.

Sole U. S. Agents

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THE HOFFMAN ARMS COMPANY

100 East 42nd St., New York



This is the JN4D-2 Training Plane. Built with an Ideal Construction Outfit.

Be a Junior Aviator!

Build and Fly Your Own 3 ft. Model Aeroplane and have the finest sport in the world!

BLUEBIRD Racing Aeroplane (PICTURE BELOW)

A graceful, swift 22-in. racer, guaranteed to fly. Will race to 100 ft. and fly 300 ft. or more. Just the thing for real fun this summer. Complete outfit, ready to fly, including winder; postpaid for \$1.75.



IDEAL Scale Drawings and Building-Flying Instructions show you how to build and fly accurate 3 ft. Models of any of the following famous 'planes. Complete plans for any one sent postpaid for 25 cents! **Curtiss JN4D-2 Training Plane; De Havilland 'Round-the-World' Flyer; N.C.-4 Naval Sea-plane; Bleriot, Nieuport or Taube Monoplane; or Cecil Peel's Racer.**

(Set of 7 Plans, \$1.25 postpaid) Complete 49 pp. catalog of Models, Parts, Supplies—6c

FREE—6 pp. descriptive circular mailed free upon request.

Ideal Aeroplane & Supply Co.

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GLAROFF Kills Headlight Glare.

Our representatives making from \$12 a day up to \$2000 yearly. Simple new device protects driver from glare of headlights and sun. Write for Special Free Offer. **GLAROFF MFG. 809-E Road St., Steam Falls, N. Y.**

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Unbreakable Trio Self-Filling Fountain Pens

Guaranteed for 2 years. "It makes Carbon Copies"

GREEN, RED, SELLS FOR \$1.25. SAMPLE 67c



Money refunded if you do not think it's the best pen you ever wrote with. Finished in beautiful green, red, purple, or black. Send for wholesale quantity price list and distributing plans. **F. SPORS & CO., 357 Main St., LESLIE CENTER, MINNESOTA**

66 Miles on 1 Gallon

Amazing Scientific Gas Saver

For All Make Autos. Spare or full time Agencies Wanted Everywhere

1 FREE TO ADVERTISE

BIG PROFITS Showing to Autoists

CRITCHLOW, Inventor, K-111, WHEATON, ILL., U.S.A.

Boys: carry a Leedawl COMPASS on your hikes—



\$1.50 at Dealers or remit direct if not obtainable locally

Flyer Instrument Companies ROCHESTER, N.Y.

Magnapole Compass \$1.75
Litenite " \$2.00
Aurapole " \$3.50
Ceebynite " \$4.00



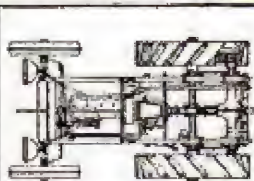
FLY

Young man learn aviation. Build this classy plane and learn to construct and operate aircraft. Use your motorcycle engine or our "Motor" 20 h. p. motor. We furnish parts very reasonable to build this wonderful little "Motorplane," the World's first successful motorcycle engine aeroplane. Send \$3.50 for complete set of blue prints and parts list of this latest Model M-T-2.

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Makes Old Ford a Tractor

We furnish everything for converting Ford Auto Chassis with Engine into a handy Farm Tractor. Just right for truck growers, small farms, nurseries, etc. Pulls 16" Plow, Discs, Seeds, Cultivates; runs Belt Machinery. It is easy to buy this tractor, and it is easy to build by following the Blue Prints furnished by our Engineering Dept.



Besides all the Tractor Parts, we furnish complete set of working Blue Prints and easy to follow instructions at \$3.75 per set. We tell you just how to saw off the rear end of the Ford frame, how to attach the tractor drive wheels, how to gear it, etc. You can't go wrong. It's really very simple. In doesn't take a mechanic. Anyone with a few ordinary tools can do the job in a short while.

Write for Free Circulars or send \$3.75 for Blue Prints **SHAW MANUFACTURING CO., Engineering Dept., Galesburg, Kans.**

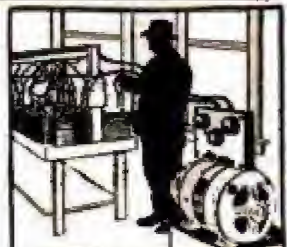


\$150 to \$300 PROFIT MONTHLY FROM HB ONE DAY BATTERY CHARGING

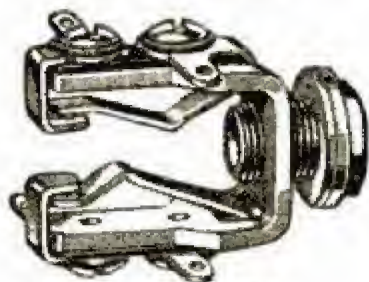
Own a big moneymaking business recharging auto and radio batteries, with HB One Day Battery Charger. Auto and radio owner demand fast service—get their trade with an HB. No experience needed. Only \$35 cash brings complete equipment on 30 days' free trial with moneyback guarantee. Your big profits easily carry the balance in easy \$16.50 monthly payments for a few months. Over 14,000 shops making big profits—you can, too! Write for free bulletin 50.

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The NEW FROST-RADIO GEM-JAC is ready!

IT IS the smallest and most compact radio jack made. An entirely new principle in spring design. The GEM-JAC projects only 1 inch back of panel. Has extremely low capacity effect, self-cleaning contacts, Bakelite insulation, sterling silver contacts, nickel plated brass frame. **FROST-RADIO GEM-JAC** gives you more room in your set for other parts. Order from your dealer NOW

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Saxophones

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Are Built to
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WHETHER you are just learning to play or are a finished musician you will find "King" Saxophones, Trumpets, Trombones and Horns, easier to play than any other make.

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Play a Tune in 10 Minutes!

On the Ukulele, Banjo Ukulele, Tenor-Banjo, Guitar or Mandolin

Amazing new invention has completely revolutionized playing of stringed instruments. As simple as 1-2-3! Merely press numbered keys and start to play at once. Think of it! You start right in to play your favorite stringed instrument without tiresome practice—without expensive lessons—without a knowledge of music.

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Now you can have lots of fun at parties, picnics, when camping, motoring, in the parlor, on the porch—anywhere and everywhere you will be the center of attraction, the life of the party. Enjoy the thrill of having people look up to you. Be a leader—not a follower.



No Knowledge of Music Necessary No Tiresome Practice

Now you can play your favorite stringed instrument at once, without knowing one note of music. These marvelous new Ferry Instant Playing Instruments take all the work out of learning to play. No expensive lessons. No complicated musical signs and symbols. You merely press the numbered keys and start right in to play!

Free Trial

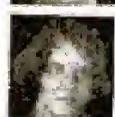
Our 116 Free Book shows our complete line of Instant Playing Stringed Instruments and tells how you can play your favorite stringed instrument in your own home for six days and evenings at our risk. If not 100% satisfied it all costs you nothing.



Bertie Asten, Belmont, N. C.
"I am very much pleased with my Ferry Instant Playing Guitar. I never thought of learning to play so fast. The Instant Player is a great invention. I would not be without one."



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"I have received the Instant Playing Banjo Ukulele. It is a real nice instrument and so easy to play. My friends like it very much. My sweetheart has also learned to play it and we have a lot of fun."



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"I am delighted with my Instant Playing Ukulele. I quickly learned to play the songs in your big book of music and now play popular music just fine."



John Kerry (Cowpuncher) Casper, Wyoming
"Your Instant Playing Tenor Banjo is great. I started playing at once just like you said I could. I never thought I could learn to play it so easily, especially since I couldn't learn to play by other methods."

So Easy to Play

The Instant Player makes it easy to play stringed instruments. It has taken all the drudgery out of learning to play. It is made for the person who would like to play but who hasn't felt able to give the time, effort, patience and money necessary with old methods. Play the easy way—the modern way!

Free Book

If you want us to prove our claims with no risk to you—if you want more fun out of life—new friends—money-making opportunities—if you want to play tunes at once—send the coupon for free book telling how. Soon you, too, can know the joy of making your own music. Instant Playing stringed instruments are sold complete or the Instant Player can be attached to your old instrument in a jiffy. Mail the coupon NOW!



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Will it be an Instant Playing Ukulele, Banjo Ukulele, Tenor Banjo, Guitar, Mandolin, or a Banjo Mandolin? You can play the instrument of your choice at once. Send coupon today for proof and Free Book.

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handle, and three loose hooks in tiled bath room
wall were all put into good usable condition at an
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enclose 35 cents in postage stamps when
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Dept. 37, 574 Communipaw Ave.
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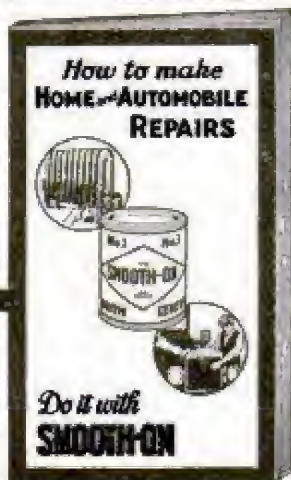
Do it with **SMOOTH-ON**

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shows, in addition to
above profit on
flower-box mold, he
made \$15.00 profit on
each of 300 lawn benches;
\$2.50 profit on each
of 250 vases; \$10.00 on
each of 80 bird-baths, etc., etc.

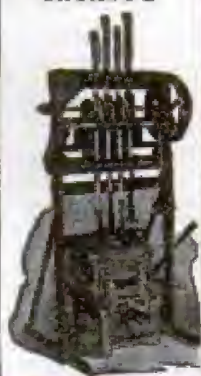
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500 Punctures Without Loss of Air

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To Demonstrate My Guaranteed
MILBURN PUNCTURE-PROOF TUBES

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ARE waiting for my amazing long-life, no trouble, air-filled, puncture-proof inner-tube—the *only* tube to successfully withstand the *500-nail-hole-plank-test* without loss of air. Costs no more than the ordinary tube and is sold under a *positive, money-back guarantee*.

WARNING

I am the originator of the air-filled puncture-proof tube. *Beware of imitations.* I have no other connection with any "so-called" puncture-proof tube.

M. E. Milburn.

MAKES MOTORING A PLEASURE—DOUBLES TIRE MILEAGE

Users of *Milburn Puncture-Proof Tubes* everywhere are enjoying the easy riding performance of the air-filled tube *without the annoyance of punctures and slow leaks*. And a tire mileage increase from 12,000 to 15,000 miles. Many users report 30,000 miles (double mileage) without removing a tire from the wheel.

MONEY-BACK GUARANTEE

We hereby agree to refund to any purchaser the full amount paid for any *Milburn Puncture-Proof Tube* that leaks air when punctured by anything not larger than a twenty-penny spike. We also guarantee that casings will last much longer and give much greater mileage when *Milburn Puncture-Proof Tubes* are used.

PROOF

J. D. Cooper—"I have made 30,000 miles with my *Milburn Puncture-Proof Tubes* and have not as yet removed a rim or casing and my casings are in excellent condition."

J. T. Berdahl—"Have been using *Milburn Tubes* since 1922, driving every day. Have pulled out any number of nails without loss of air."

S. C. Wintrey—"I have driven 600 miles in one of my *Milburn Puncture-Proof Tubes* without loss of air."

J. S. MacElroy—"Received the shipment of 200 *Milburn Puncture-Proof Tubes* and find them as represented. Hope to send you another 200 tube order soon."

W. H. Rodman—"I wish to praise your *Milburn Puncture-Proof Tubes*. They can't be beat. I drove 13 miles in one tube and I haven't put any air in it since. Everyone is wild over your tubes."

TEST THE MILBURN AT MY RISK

You'll be delighted. And you'll realize how easily orders are secured. Sales experience is not necessary to coin money selling the *Milburn*. *Positively the biggest tube value obtainable.* Absolutely non-competitive. I control all basic patents. Car owners buy on demonstration. It makes no difference what tires they use or what car they drive.

\$178.56 IN 6 DAYS

That's what A. Murphy made the first six days out with *Milburn Puncture-Proof Tubes*. "I made \$14.04 in ten minutes with your tubes." Chas. Clayton. "The first three days out selling your tubes I cleaned up \$58.50."—J. C. Jerves.

FREE TUBE OFFER

Stop working for others! Get into business for yourself selling *Milburn Puncture-Proof Tubes* and you, too, can make big money. My No-Capital-Direct-From-Factory-Sales-Plan makes it easily possible. Line up your territory rights on this whirlwind seller—full or part time—**NOW**. National advertising campaign just starting. Big season here. Act quick. Clip and mail the **FREE TUBE COUPON**—**NOW**. References: Industrial State Bank, Baker State Bank, Chicago.

M. E. Milburn, Pres.

Milburn Puncture-Proof Tube Co., Inc.
132-336 West 47th St., CHICAGO, ILLINOIS

MAIL NOW

M. E. Milburn, President **FREE Tube Coupon**

Milburn Puncture-Proof Tube Co., Inc.
132-336 W. 47th Street, Chicago, Ill.

If the money-making opportunity is as big as you claim, I am interested in receiving the facts so that I can enjoy a share of the profits selling *Milburn Puncture-Proof Tubes*. Without obligation, send me information about commission and Free Tube Offer to car owners.

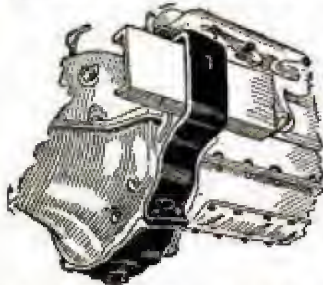
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Makes Motor and Frame ONE Unit

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WINDSOR MOTOR STABILIZERS

Because of Remarkable Results. Prevents Crankcase Trouble and Oil Leakage; Prevents Broken Crankcase Arms. Keeps Motor in Alignment with Rear End. Stops Vibration and Gives You a "Sweet-Running" Motor. Shipped prepaid anywhere in U. S.

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It shows what YOU need!
New Folding Boat, Wall's Tents,
Air Mattresses, Sleeping Robes, Flab-
bing Capes, Waders, etc. Pocket size;
many pictures. Write now.

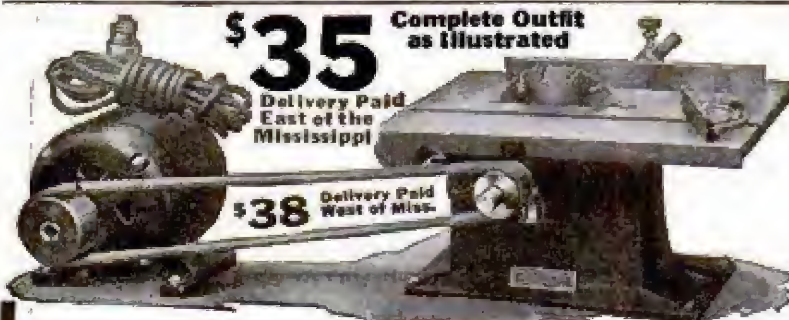


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"Comfortable
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SEND 10c INSTAMPS FOR CATALOGUES
—BIG MONEY SAVING FOR YOU—
Used and rebuilt motorcycles \$25 to \$100.
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All machines fully guaranteed.
New bicycles and motorcycles
at factory prices, save dealers
profits. Motorcycle and auto-
mobile tires \$3. Complete line
frames, engines, supplies.
DENINGER PRICE CUTTER, ROCHESTER, N. Y.
PAY AS YOU RIDE



Saw Table Can be purchased with 6-inch saw for... **\$22.50**
Delivery paid East of Mississippi.
\$24.50 Delivery paid West of Mississippi.

Motor This heavy duty motor can be furnished separately for delivery paid East of Mississippi. **\$12.90** Delivery paid West of Mississippi. Complete with Gear, Plug and flat or grooved Pulley. Guaranteed 50% Overload. Special Prices on Quantities of 10 or Over.

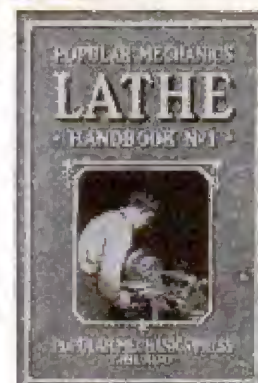
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A practical lathe for shop or home. Cone or Rack Geared Head; 6" swing, 12" or 18" between centers; speed 180 to 1750 R. P. M. Will do wood or metal turning. Low price, high quality. Send for complete information on Baby Grand Lathe, Drill, Grinder, etc.
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We receive, repair and balance your used balls and return them your original better than new because of patented cover.
SEND 25c MONEY — Send balls today. 5 day service. Balls returned C. O. D. 3 balls \$4; 6—\$1.00; 12—\$1.50. Free literature on "Golf Ball Dr." tells how you receive balls perfectly at home for 30 cents each.
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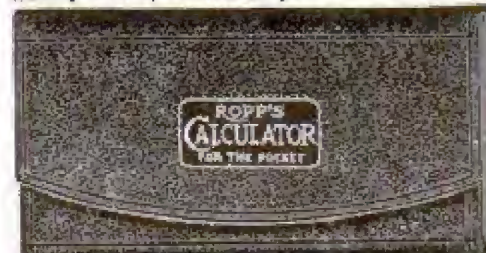
This book contains the experiences of 106 successful operators in the U. S. and in the principal foreign manufacturing countries. 83 articles tell how to make special lathe tools and attachments. 33 on gauges and indicators. 23 on special devices for holding work. 9 special lathe centers. 29 on how to do unusual jobs. 28 on boring and drilling. 11 on thread cutting.

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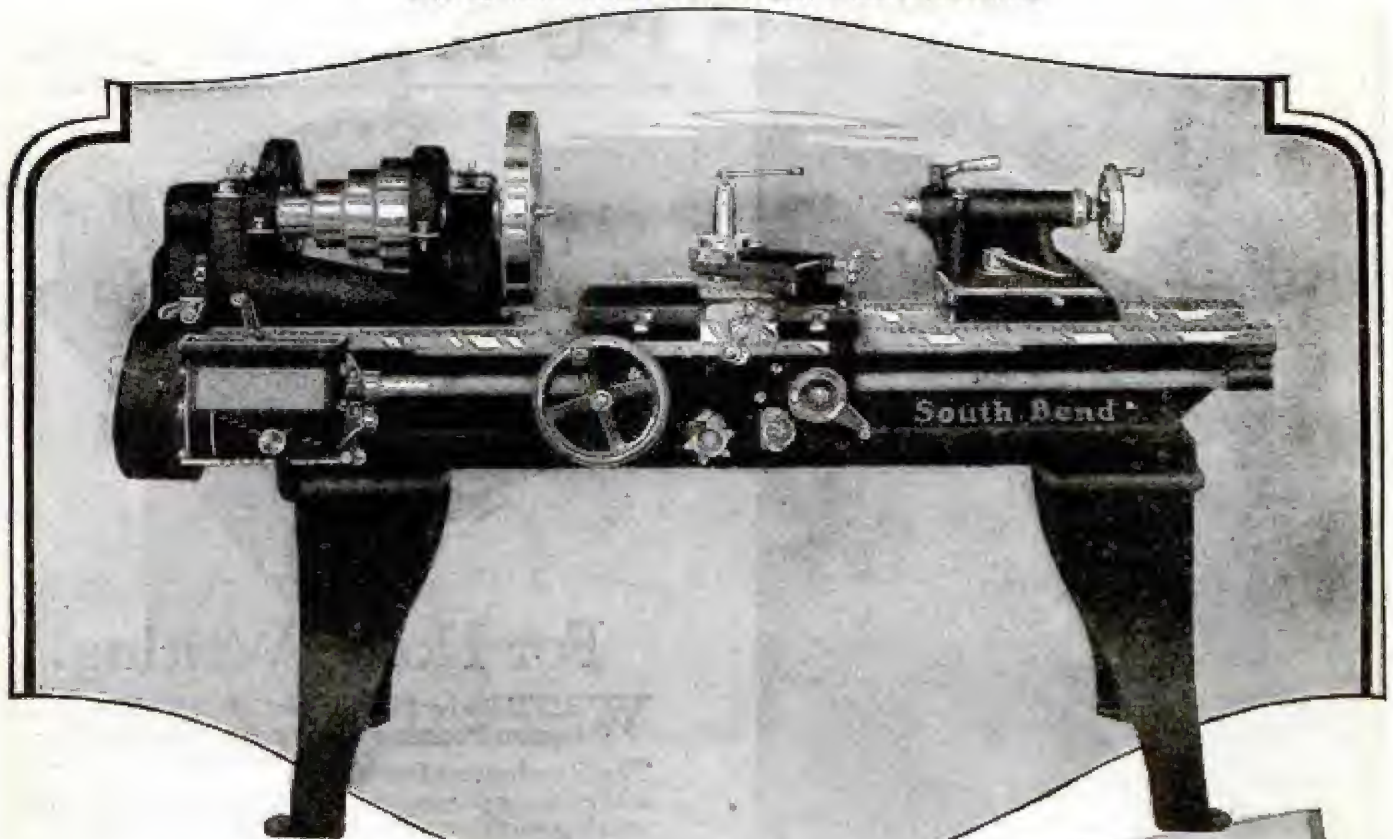
MECHANICS BENCH SAW

With this saw you can make your own repairs in shop, home, farm or garage. Makes a clean edge on the toughest wood—no planing necessary. Rips, cross-cuts, bevels, miters, mortises, tenons, or grooves. Attach to any lampsocket. Weight only 61 lbs. Will cut up to 1 1/4" All metal. Saw size 6 in. Table 10x13, base 7x11 height 7 in. Table tilts for beveling 5 degrees left 10 degrees right.

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The New South Bend Lathe

— the Lathe with Practical Attachments



- for Manufacturing Plants
- for Tool Rooms
- for Machine Shops

The New South Bend Lathe is a precision tool of finest quality. Developed from our 22 years of experience at a cost of more than a quarter of a million dollars. It represents the—

Most Attractive Lathe Value Ever Offered

It is outstanding in performance and appearance, and can be provided with attachments that make it a "whole shop in itself." No matter what your present shop equipment may be, you can profitably add the New South Bend Lathe in the sizes best suited for your work. They are powerful, accurate and rapid, with every known convenience for operating speed and efficiency.

Get Catalog—Compare Prices

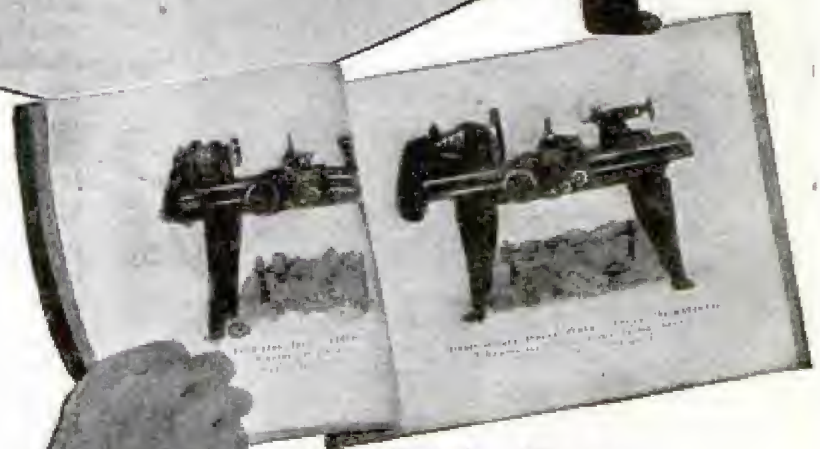
South Bend Prices are always attractive—and especially so now on these New Lathes. For example, Screw Cutting Lathes with Quick Change Gear priced as follows:

9" x 3'	\$ 258.00	16" x 7'	\$ 537.00
11" x 3½'	304.00	18" x 10'	746.00
13" x 5'	387.00	21" x 12'	1116.00
15" x 6'	468.00	24" x 14'	1503.00

Any size placed in your shop on easy payments if desired.

Write for Free Catalog

SOUTH BEND LATHE WORKS
809 E. Madison St. South Bend, Ind.



Catalog Shows 96 Styles and Sizes

Everything from the smallest Bench Lathe to the largest Factory Production Lathe. Send Coupon for the Free Catalog, net factory prices and easy payment terms.

Time Payments for those who wish to buy out of Income instead of Capital

SOUTH BEND LATHE WORKS

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Gentlemen: I would like your net factory price on a

Screw Cutting Lathe, size _____ for (check

kind of work) ☐ Manufacturing ☐ Garage Work

☐ Machine Shop ☐ Vocational Work

Please send Free Catalog. ☐ Time Payment Plan.

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For Home Writing!

WRITING by hand is out of date. The Remington Portable Typewriter has made it so.

The Remington Portable is ever so much faster, and enables you to make copies of your personal writing without extra effort. It is a necessity of modern, fast-moving life.

Graduation time will soon be here. What finer or more helpful commencement gift than a Remington Portable for the boy or girl who has college or business days ahead!

It is the handiest, fastest, simplest to operate, and most dependable of all portables—and it is the smallest, lightest, most compact portable with standard keyboard.

Give yourself more leisure by saving time with a Remington Portable. You can purchase it on terms as low as \$10 down and \$5 monthly from Remington branches and dealers everywhere. Write today for our illustrated booklet, "For You—For Everybody". Address Department 12.

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TYPEWRITERS

Remington-made Paragon Ribbons and Red Seal Carbon Papers always make good impressions



**A MACHINE FOR
EVERY PURPOSE**

60 MILES ON A GALLON OF GASOLINE

TESTS SHOW FORD CAN RUN 60 MILES ON A GALLON

The amazing fact that a Ford can run 60 miles on 1 gallon of gasoline was recently brought to light through tests conducted by America's foremost engineers, where it was shown that a gallon of gasoline contains sufficient heat units which if properly atomized and mixed with air would give this additional mileage. Great strides have already been made in this direction by the recent invention of a simple attachment which can be installed in a few minutes without any alterations to the motor. It is common for Ford Owners to make from 40 to 44 miles per gallon after this marvelous device is attached.

MOST WONDERFUL INVENTION TODAY BRINGS JOY TO FORD OWNERS

Starts Ford Instantly

Starting a Ford Car in cold or zero weather is something every Ford Owner dreads—everybody realizes that difficult starting is an abse on the starter and battery. Thousands of Ford Cars are "laid up" during the Winter just for these reasons. This great difficulty has been overcome. "The SUPER positively starts a Ford Car instantly in the coldest weather."

Marvelous Device

The SUPER is no trick affair—requires no mechanical adjustments and contains all the scientific principles of carburetors costing \$20 to \$35 and in its natural action uses up every particle of unused gasoline and breaks it up into a perfect vapor. The hitherto impossible is now realized by the SUPER.

Everybody Satisfied

Saves 3 to 7 Dollars Per Month

The best investment I ever made. The SUPER is saving me from three to seven dollars each month, besides putting new life into my motor.

A. H. WORRA, Iowa.

Makes 44 Miles Per Gallon

I have tried the SUPER and the results of the experiment are satisfactory. One quart of gasoline run my Ford 11 miles over improved roads which is just about again as far as I could run with the plain Ford Carburetor.

G. E. YODER, Penn.

Finds That Our Claims Are Correct

I find that your claims for increased mileage are correct and that a big saving is made by your SUPER. In fact, the best device I have met with in that line.

M. J. VAN LEEUWEN, Mass.



The
Heart
of the
Motor

Eliminates Oil Pumping in Front Cylinder

What a wonderful relief to Mr. Ford Owner when he realizes that he can run his car without the motor pumping oil in the front cylinder. Sounds like an awful lot to expect of any device, but that is what the SUPER does and this is only one of its many advantages because it puts real efficiency into any Ford Car.

Complete Combustion

The SUPER is so designed that it takes advantage of the present Ford Carburetor and properly atomizes the light as well as the heavy elements of the fuel, converting every atom of gasoline and kerosene into power preventing liquid fuel from passing into the cylinders, thus avoiding carbon formation and oil dilution.

Easy to Sell

Sells Like Hot Cakes

This is a recent letter from one of our distributors: "Enclosed find draft for 200 more SUPERS, rush as I need them badly. I sold and banked \$104.00 in one day. Hope to sell 1000 SUPERS next month."

A. W. LEONARD, Penn.

Making Big Profits Every Noon

I have been working the SUPER at noon only. Yesterday noon I made more money with the SUPER than I did all my 11 hours' hard work in the factory all day.

J. L. LEHNER, Wis.

Had No Previous Selling Experience

This letter shows what ambition does: "I sold six SUPERS in less than 2 hours tonight. I think it's a pretty good start—for it's the first thing I ever sold."

E. MANGOLD, Ind.

\$60.00 TO \$150.00 PER WEEK EASY

You just can't help making Big Money selling the SUPER because a trial sells itself and soon everyone in the neighborhood get talking about this marvelous device. Men like Leonard, Shaw, Manner, Kinsley, Peters, Sands, Beck and Hall are not exceptional salesmen, but just the type of men that saw an opportunity and were quick to grasp it when within reach. No previous selling experience is necessary, just a little ambition on your part to make money is all we ask and we will extend the same opportunity to you. Spare time will pay you well. If you can devote your entire time so much the better, because the SUPER is a whirl-wind seller and takes hold in a locality like wildfire.

Men Wanted Everywhere To Introduce

We want distributors in all parts of the country to take orders and deliver the SUPER and to look after the repeat business that is bound to follow and to such distributors we are willing to assign territory. You do not have to own a Ford to take up this proposition but if you have a Ford it is easier to explain its many advantages. However a Trial of the SUPER convinces the most doubtful person and tells a wonderful story.

A REAL FUTURE HERE

WEEKS SUPER CARBURETOR CO.

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MAIL TODAY
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426-1636 Eleventh Street, Milwaukee, Wis.
 Gentlemen: Please mail me full free particulars about your wonderful invention.
Name.....
St. or R.F.D.....
Town.....
County.....
State.....

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A WEEK
TO START!**

*you can
get it!*

**Floor Experts
make *REAL* money,
- and so can you!**

**Be Your Own Boss
in a Trade with
No "Dull Sea-
sons" and No
"Lay-Offs"!**

**Send In That
COUPON
and we will
tell you how
to get going**

Floor finishing by the new Electric JOHNSON method is a specialized trade which is NOT crowded. You can start at it without long and costly training. Almost overnight you begin to cash in. And the demand for your work will steadily increase as you create floors of lustrous brilliance. Let the coupon tell you all!

Every worth-while home in town is your sure customer. So is every good store . . . every restaurant, hotel, club, hospital, bank, office building. All of them should have their floors polished, their linoleum waxed, REGULARLY. Do such work EXPERTLY—and you collect \$15, \$20, \$25 a day spot cash right along. Others do!

Master It in a Day!

With our skilled instruction, and the Johnson equipment, you become a MASTER Floor Polishing Expert at once. It isn't hard work. The Electric Machine does it almost all. You merely wax-film the floor surface and guide the Polisher over it. Instantly there is a burnished, rich gloss, beautifully deep-waxed and long-lasting. You can have all the work you want, day-in, day-out, the year around. Your pleased customers will recommend you to others.

A Million Dollars of Our Own Money

This year we are spending in nation-wide advertising \$1,000,000.00 to sell this Electric Floor Waxing ideal to the American people. For forty years we have been the foremost authorities on floor finishing. Now YOU can cash in on this great market.

Homes, Stores, Hotels, Theaters WANT

This Service NOW!

You don't have to CREATE a demand for Floor Waxing. We have done that and are doing it. EVERY hardwood floor, every yard of linoleum, should be waxed. No way compares with this for beauty and permanence. It is YOUR opportunity.

You Won't Have To HUNT Work

People will come to you for this service once they know you are giving it. You will have a prosperous business of your own going almost instantly. From then on all the comforts and many of the luxuries of life will be yours.

**Clip This
Coupon
Out and
USE It!**

JOHNSON'S WAX Electric floor Polisher

Simply connect Polisher to any light socket or electric service outlet. Silently and swiftly the machine does the finest polishing conceivable, ten times quicker than by hand. Gets under and around heavy furniture, burnishing every inch of floor.

This Is No Mere "Correspondence Course" We Offer You!

Our Instruction Service is given absolutely FREE. You invest less than \$50 for complete mechanical equipment: Waxing-Mop—a supply of JOHNSON'S LIQUID WAX and the completely equipped Electric Floor Polisher, ready to use. You need nothing more to launch a paying business for yourself.

Send In That Coupon NOW!

At least find out about this wonderful chance to get into business paying around \$110 a week from the start. Send us the coupon and get all the actual facts.

S. C. JOHNSON & SON, Racine, Wisconsin
(CANADIAN FACTORY, BRANTFORD)

S. C. Johnson & Son, P. A. 5, Racine, Wis.

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Please tell me how I can realize \$110.00 a week giving expert Johnson Electric Floor Waxing Service.

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You make two big savings when you buy from us. 1st: You save one-third to one-half because of our wholesale factory-to-user price. 2nd: You save the cost of unnecessary waste and high labor because of our cut-to-fit plan and easy installing features which enables you to put in your own plumbing or heating systems.

"CHICAGO" Bathroom Outfit \$59.95 Special Price — Highest Grade

Fixtures furnished with our Chicago bathroom outfit are built along practical and attractive lines, are perfect and of the highest-grade that it is possible to MAKE. Shows that FIRST quality Hardin-Lavin products can be had at low costs.

New Swinging Sink Faucet



New solid brass, heavily nickel-plated combination quick compression double sink faucet. White vitreous handles marked, "Hot" and "Cold." Snow white solid china elevated quick removable soap dish with drain. Easy to clean. This fixture is adjustable to fit any sink back. Also furnished without soap dish. D325½—Price less soap dish. Shipping weight 7 pounds. \$4.65 D325¾—Price complete as shown. Shipping weight 8 pounds. \$5.75

Deep Apron Lavatory

Late design, white porcelain enameled, cast-iron drop apron lavatory, supported on concealed wall hangers; new low design, china indexed compression faucets, heavy brass nickel plated adjustable supply pipes and trap to floor or wall, size 17 x 19½ inches, weight 120 pounds. Chicago D-11—Lavatory, complete as shown with Iron-Pipe Connection. Special. \$12.75

White Closet Outfit

Improved, snow-white, composition China closet tank, (beautiful and indestructible); fitted with solid brass elevated noiseless valves and improved china flushing handle. Highest-grade white vitreous china syphon washdown bowl. Highly polished, reinforced birch mahogany seat, with heavy brass, nickel-plated bar hinges, flushing ell, supply pipe, closet bolts, etc., weight 125 pounds. Chicago D-12—White Closet Outfit, complete as shown, with iron pipe connections. Special. \$18.95

Chicago D-13—Bathroom Outfit, complete as shown and described. Special. \$59.95

All shipped out of our Chicago plant same day order is received. Order today and save. You cannot lose.

Everything in Plumbing and Heating at Wholesale Price

Send the coupon for our FREE bargain catalog which explains our new easy method of installing factory-fitted heating plants and plumbing systems. For fifty years we have been saving economy buyers hundreds of thousands of dollars in the cost of Bathroom Outfits, Hot Water, Steam and Warm Air Heating Plants, Pipeless Furnaces, Water Supply Systems, Water Heaters and Supplies. Everything you get from us is guaranteed to be highest quality, grade A merchandise with new exclusive features. We supply FREE INSTALLING PLANS and show you how with simple diagrams and clear instructions. All necessary tools loaned FREE.

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Every Hardin-Lavin system is figured to eliminate long runs of piping, to save valuable time and unnecessary materials and expensive labor. Our many years' experience with all kinds of conditions and types of construction means practical, money-saving service to builders, realtors, contractors, mechanics, institutions, home owners, etc. Write us about any plan or problem you have. We will help you without obligation—estimates free.

Ask for Free Plan and Estimate

Send us a rough sketch or blue print of the arrangement of your rooms and we will figure the wholesale cost of your plumbing system or heating plant. We will show you many kinks and wrinkles and make savings that will surprise you. We furnish a Cut-to-Fit plumbing outfit or heating plant for the exact job with FREE Installing Plans so that any handy man can do the installing.

Our BONDED GUARANTY and LABEL PROTECTS YOU

We guarantee that every water supply system, plumbing outfit, heating plant or any article that you buy from us, from the smallest fitting to a complete installation, is perfect and exactly as shown and of the HIGHEST GRADE possible. We further guarantee that if for any reason you are dissatisfied you can return any goods bought from us and we will immediately refund your money plus freight charges you have paid. Could Anything Be Fairer?

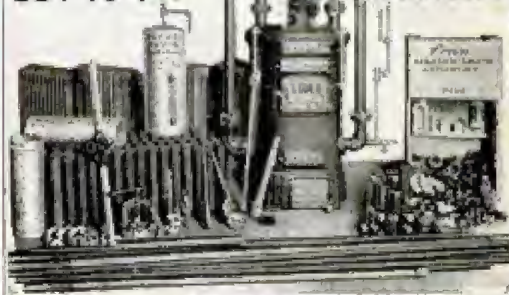
(Signed)
HARDIN-LAVIN CO.



White Enameled Bathtub

Heavy white porcelain, enameled inside and over the 3¼ inch turned-over rolled rim; outside of tub is painted. This is our newest design, having a pleasing appearance and is the highest-grade leg tub manufactured. Fitted complete with heavy brass, nickel-plated compression bath faucet, with china indexed handles, nickel-plated heavy brass adjustable waste and overflow and supply pipes to floor; width 30½ inches, length 4½ or 5 feet, weight 300 pounds. Chicago D-10—Bathtub complete as shown with iron-pipe connections. Special. \$31.10

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Complete Hot Water Plant ready for shipment with set of tools. Outfits complete as low as \$200

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In 5 minutes you demonstrate tire secrets the average dealer knows nothing about. All in well bound portfolio with good size samples of fabric, cord, rubber, cross sections cut from tires and pure gum tubes.

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CORD TIRE FREE and \$300 a Month!

Here's your tire—the world's finest. Hand made—over-size, semi-balloon type, fits any wheel or rim, uses 40% less air pressure—gives balloon comfort and efficiency. Big thick tread. As near skid proof, rut proof, wear proof as it is possible to get. **NEW JOY IN RIDING** rough roads. Now any man who owns a car can get a free tire and *make big money* for a little time in showing and recommending Mellinger Cord Tires. Make your car an asset, not an expense. *With the Mellinger Plan you don't risk a cent.* The biggest opportunity you ever heard of. Let me send you an amazing free book that tells of the *Mellinger Plan* and how you can easily make \$300 a month and get your own tires Free.

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